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Carefree, Connected, and Driving: A Study of Social-Structural Factors Contributing to Texting while Driving among Teenagers

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1. Introduction

The mobile phone ("mobile") has become a cornerstone of social relationships in the U.S., as over 90% of adults and 80% of teenagers own one (Madden, Lenhart, Duggan, Cortesi, & Gasser, 2013; Smith, 2013). Although mobiles are functional in many ways, they have also produced a number of dysfunctions. In particular, 26% of car accidents in the U.S. were associated with mobile-related distractions (Lane, 2014). However, and most alarmingly, not only are automobile accidents the leading cause of death among teenagers (Centers for Disease Control, 2012), but also 21% of accidents among teenagers were associated with mobile-induced distracted driving (National Highway Traffic Safety Administration [NHTSA], 2013). With the first generation raised in a 'mobile' culture now of driving age, mobile-induced distracted driving among teenage drivers is an especially salient and critical issue for parents, researchers, policymakers, and the automotive industry. An impressive body of research provides substantial evidence of the dangers of mobile use while driving (Bayer & Campbell, 2012; Caird, Johnston, Willness, Asbridge, & Steel, 2014; Cook & Jones, 2011; Douglas, Paullet, & Pinchot, 2012; Nemme & White, 2010; Wilson & Stimpson, 2010; Olsen, Shults, & Eaton, 2013; Lee, 2014; Owens, McLaughlin, & Sudweeks, 2011), and numerous campaigns have sought to encourage new drivers to avoid using the mobile while driving (Ad Council, 2015; AT&T, 2015; Epstein, 2010; NHTSA, 2015; Red Thumb Campaign, 2014); however, research on the influence of other non-driving related social factors on teenagers' mobile use while driving is still in a nascent stage. Therefore, the purpose of this study is to examine social factors contributing to mobile use while driving – exchanging text messages ("texting") – among teenage drivers. Specifically, the study examines the impact of socio-behavioral factors (i.e., how often teenagers spend time with friends, who they text, and how they use their mobiles) and agents of socialization (i.e., parental influence and school policy) on the likelihood of texting while driving among teenage drivers.

2. Theoretical Framework

2.1. Internalized Social Behaviors

Teenagers are being raised in a technologically saturated social world in which technological multitasking has become normative (Baym, 2010; boyd, 2014; Turkle, 2011). With 73% of teenagers owning a mobile by the age of 13 (Lenhart, Ling, Campbell, & Percell, 2010), they are well socialized into a mobile culture by the time they are of driving age. Numerous studies have provided evidence that, despite drivers' confidence in their abilities to multitask, cognitive attention as well as driving performance decline when managed simultaneously with other tasks (Fitch, Soccolich, Guo, McClafferty, Fang, Olson, Perez, Hanowski, Hankey, & Dingus, 2013; Klauer, Guo, Simons-Morton, Ouimet, Lee, & Dingus,

2014; Sanbonmatsu, Strayer, Medeiros-Ward, & Watson, 2013; Strayer, Watson, & Drews, 2011). Yet, in a social world in which multitasking is normative, people often engage in mobile multiplexing (i.e., communicating through various media on the mobile) (Seiler, 2015). We anticipate that teenagers, who were raised within a mobile culture, are likely to also engage in mobile multiplexing. As a testable hypothesis, we suggest,

> (H_1) *teenage drivers who talk on the mobile while driving are more likely to text while driving than teenage drivers who do not talk on the mobile while driving.*

Mobile multiplexing reflects a complex social structure based upon a sense of constant digital connection to others (Baron, 2008; Katz & Aakhus, 2002; Turkle, 2008; Wei & Lo, 2006). With the mobility of the Internet, teenagers' social lives reflect a blending of online and offline social interactions (boyd, 2014; Turkle, 2008). Accordingly, the mobile facilitates the remote management of online and offline social life, which produces a tethering effect, i.e., a social context culturally defined by perpetual digital availability. Such norms of reciprocity require teenagers to remotely manage their relationships within various social environments (Gergen, 2002; Horstmanshof & Powers, 2005; Palen, Salzman, & Youngs, 2000; Plant, 2001; Turkle, 2008). Since teenagers internalize a perpetual mobile connection to others, they are likely to text within various public social settings – even if such uses conflict with the norms of the social environment. Driving is simply a qualitatively different social environment, and teenagers who tend to text in public social settings with norms that discourage open mobile use are equally likely to text while driving. Therefore, we hypothesize that

> (H_2) *teenage drivers who text during class are more likely to text while driving than teenage drivers who do not text during class.*

The classroom, of course, just represents one possible environment that teenagers must negotiate; yet, it is social space in which the violation of interactional norms can be met with rather unpleasant sanctions (e.g., public reprimand, dismissal from class, detention). Therefore, teenagers who attempt to simultaneously negotiate their mobile interactions and while maintaining the norms within such an environment are also likely to attempt to manage driving norms while using their mobiles.

Mobile multiplexing and the development of this mobile "by-psyche," in which people are cognitively split between the physical and digital social environments, (Plant, 2001) are the byproduct of organic social processes through

which teenagers exploit the utility of the mobile for negotiating their social lives (Gergen, 2002). The mobile is simply a device that facilitates remote, digital interactions, which teenagers use to supplement, but not replace, face-to-face social interactions with friends (Hanson, 2007; Ishii, 2006; Kim, Kim, Park, & Rice, 2007; Leung & Wei, 2000). In fact, social life is no longer dichotomized between the face-to-face and digital interactions; rather, face-to-face and digital social interactions are fluidly managed simultaneously and, thus, producing a constant digital copresence in which friends and significant others (e.g., boyfriends or girlfriends) are perpetually present and available for interaction (Gergen, 2002; Seiler & Kidwell, 2016; Turkle, 2008). Therefore, as part of this fluid process, teenagers not only manage face-to-face and digital interactions simultaneously, but also the face-to-face interactions can simply be fluidly transferred to digital interactions when leaving the physical presence of others. Therefore, rather than assuming that teenagers use mobiles for interaction with friends and significant others *instead* of spending time with them face-to-face, it is likely that those who spend time with close others face-to-face also interact with them via the mobile often. Moreover, given that they fluidly move between face-to-face and digital interactions, it is likely that teenage drivers who spend substantial time with close others face-to-face will continue such interactions digitally while driving. Formally stated, we hypothesize that

> (H_3) *teenage drivers who spend time daily with friends outside of school are more likely to text while driving than teenage drivers who do not spend time daily with friends outside school.*

Considering that sociability occurs fluidly between the physical and digital spaces, mobile conversations are often used for digital interaction in the absence of physical passengers in the vehicle.

Similarly, to understand teenagers' motives for texting while driving, it is necessary to examine *who* they are likely to text while driving, not simply how often they generally text. That is, teenagers use their mobiles for a vast array of social (e.g., phone calls, texting, reading and posting to Facebook, tweeting) and non-social purposes (e.g., searching the Internet, playing games, reading books, magazines, or news websites) (Lenhart, 2015). Since most teenagers recognize the dangers of texting while driving (Hafetza, Jacobsohna, García-Espan, Currya, & Winston, 2010; Harrison, 2011), the frequency or the extent to which they use mobiles, generally, is unlikely to impact the likelihood of them texting while driving. In fact, we hypothesize,

> *(H_{4a}) the number of texts teenage drivers exchange per day will not impact the likelihood of texting while driving.*

Instead, given the dangerous nature of texting while driving, it is likely that teenagers only text *certain* close others (e.g., close friends or boyfriends/ girlfriends) while driving; that is, the decision to text while driving is likely associated with the perceived emotional closeness of the other to whom texts would be exchanged. In a tethered culture, the normative expectation is that close others should immediately reply to texts (Horstmanshof & Powers, 2005; Turkle, 2008), and the sense of urgency is often strongest among those to whom they feel the closest (Seiler & Kidwell, 2016). High school is often a critical time of emotional and social self-development in teenagers' lives. During this time, they explore various identities and construct a deeper sense of self, which produces a degree of emotional and psychological vulnerability. Since close others serve as a source of consistent role support, and, thus, a foundation for their sense of self, teenagers are likely to give normative priority to the maintenance of those relationships (McCall & Simmons, 1966). Therefore, teenagers are likely compelled to text while driving by the desire for interaction, or simply the feeling of obligation to manage the relationships, with close friends or significant others. Accordingly, we predict that

> (H_{4b}) *teenage drivers who text close friends daily are more likely to text while driving than teenage drivers who do not text close friends daily*, and (H_{4c}) *teenage drivers who text significant others (i.e., boyfriend/girlfriend) daily are more likely to text while driving than teenage drivers who do not text a boyfriend/girlfriend daily.*

In addition to growing up in a mobile culture in which people are digitally tethered to significant others, teenagers are in a stage of socialization in which they are developing their maturity of judgment (Cauffman & Steinberg, 2000), a process of replacing impulsivity with self-discipline in the decision-making process (Kegan, 1982; Lauer & Handel, 1977). The central feature of impulsivity is the lack of reflection upon the potential consequences of the action. Research suggests that not only is the haphazard use of social technology, in general (Strassberg, McKinnon, Sustaitia, & Rullo, 2013), and while driving, specifically, (O'Brien, Goodwin, & Foss, 2010), is common among teenagers, but also many of them report feeling regret regarding messages they post to social networking sites (SNSs) (Moore & McElroy, 2012; Xie & Kang, 2015). Although teenagers might recognize the dangers of texting while driving, some teenagers also might impulsively send or reply to texts while driving. Specifically, texting while driving might be more likely among teenagers who engaged in other impulsive and, thus, careless behaviors. Therefore, we hypothesize that

(H_5) *teenage drivers who have sent texts they later regretted are more likely to text while driving than teenage drivers who have not sent such regretful texts.*

2.2. Agents of Socialization: School Policies & Parental Involvement

Beyond peer socialization, authority figures have a strong influence on teenagers' perspectives and actions (Grusec & Hastings, 2014; Maccoby, 1992). We are particularly interested in the role parents and high schools play in teenagers texting while driving. First, school provides teenagers with a formal structure within which they learn culture. As such, the rules are intended to teach appropriate social norms. Not only do many schools actively discourage texting while driving, but also many of them have policies prohibiting mobile use on campus (Humble-Thaden, 2011; Obringer & Coffey, 2007). Accordingly, teenagers who are socialized into restrictive norms for mobile use at school are more likely to adhere to similar norms in other social environments (e.g., driving):

(H_6) *teenage drivers who attend schools in which mobiles are prohibited are less likely to text while driving than teenage drivers who attend school in which mobiles are not prohibited.*

Parents, as authority figures, too, play a profound role in childhood socialization (Lung & Wei, 2000). Not only are teenagers formally socialized through direct parental discipline, but also they are informally socialized through observing their parents' behaviors. Research suggests that proactive parenting contributes to teenagers' safety as well as reducing teenagers' deviant behavior (Crouter & Head, 2008). Accordingly, parental involvement in teenagers' texting behaviors is likely to discourage texting while driving:

(H_7) *teenage drivers whose parents restrict their mobile use are less likely to text while driving than teenage drivers whose parents do not restrict their mobile use.*

In this sense, the fear of consequence if caught by parents is likely to discourage teenagers from texting while driving.

However, teenagers also learn indirectly from parents through general social interaction. As family life becomes saturated with mobile connectivity, texting behaviors are likely to become normalized within the family unit. Parents who are also entrenched within the mobile culture of constant availability of others might, if only inadvertently, contribute to a type of family-level groupthink, in which mobile behaviors that people outside of the family unit

might find inappropriate or dangerous are overlooked as a result of the family group norms (Thibault & Kelley, 1959). Previous research suggests that teenagers' mobile use is generally encouraged by parents, albeit with different motivations. Parents commonly encourage teenagers to have their mobiles on them and be available to them for a variety of reasons (e.g., to encourage independence; for safety purposes; to allow them to surveil their teenagers remotely) (Blair & Fletcher, 2011; Green, 2002; Ling, 2005). Consequently, parents, as authority figures within the family unit, in their normal routine and, in most instances, unintentionally, cultivate norms of connectivity that might also inadvertently contribute to the cultivation of inappropriate or even dangerous behaviors. Therefore, we argue that teenagers whose parents are also mobile users are likely to text while driving, as a result of the normalization of constant connectivity embedded within the family unit. More specifically, we hypothesize,

> (H_8) *teenage drivers whose parents text are more likely to text while driving than teenage drivers whose parents do not text*.

3. Methods

3.1. Data & Analytic Strategies

Data analyzed for this study came from the 2009 Parent-Teen Cell Phone Survey conducted by the Pew Research Center (2009). The survey consisted of phone interviews with a sample of U.S. teenagers and their parents (n=800). Weighted data were used to correct demographic discrepancies and nonresponse patterns, in order to establish a sample representative of teenagers and parents (n=1,732) in U.S. population.[1] However, the final sample size used in this study was much smaller than the total weighted (and unweighted) sample size for the entire survey, as it was reduced to focus exclusively on teenage drivers (unweighted n=222; weighted n=443).

Using SPSS 24, in addition to univariate analyses, a 2x2 cross-tabulation and a multivariate logistic regression analysis were conducted to test the stated hypotheses regarding the likelihood of teenagers texting while driving. Whereas the 2x2 cross-tabulation tests H_1, the logistic regression analysis tests H_2 through H_8.[2] For the logistic regression analysis, a listwise deletion of missing values was conducted, resulting in a 20% reduction in the final weighted sample size (unweighted n=183; weighted n=354).

Odds ratio (*OR*) (i.e., the likelihood of texting while driving under one condition versus another condition) is provided for all, and conditional probability (*P[B|A]*) (i.e., the chances of texting while driving [*B*] under a specific condition

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[1] For details regarding the calculation of the weights, please see Pew Research Center (2009).

[2] It should be noted that the multivariate logistic regression analysis passed tests for multi-collinearity, independence, and goodness of fit.

[*A*]) is provided for most, statistically significant findings. The goal of reporting conditional probability is to clarify and elaborate upon the nature of the odds ratios. In the cross-tabulation, conditional probability were calculated using the basic formula, *P(B|A)*=(n, occurrences)/(n, total). For the logistic regression analysis, the following equation was used to extrapolate conditional probability from the log-odds provided in the SPSS output:[3]

$$P(B|A) = \frac{\exp(a + \beta_1[x_1] + \beta_2[x_2] + \beta_3[x_3] + \beta_4[x_4] + \beta_5[x_5] + \beta_k[x_k])}{1 + \exp(a + \beta_1[x_1] + \beta_2[x_2] + \beta_3[x_3] + \beta_4[x_4] + \beta_5[x_5] + \beta_k[x_k])}$$

3.2. Variables

The dependent variable is texting while driving, which is measured using the survey question (0="No"/1="Yes"): "Have you ever texted while driving?" (See Table #1 for Descriptive Statistics.)

For the independent variables, first, talking on the mobile while driving is measured using the following question (0="No"/1="Yes"): "Have you ever talked on a cell phone while driving?" Second, texting in inappropriate non-driving situations is measured using a recode of the survey question, "How often do you send or receive a text message during class?" (0="Not Daily"/1="Daily"). Third, face-to-face interaction with friends is measured using the survey question, "About how often do you spend time with friends in person, doing social activities outside of school?" (0="Not Daily"/1="Daily"). Fourth, the number of texts sent daily was measured as a count variable based upon the survey question, "On an average day, about how many text messages do you send and receive on your cell phone?" Fifth, two variables were constructed for whether or not teenage drivers text close friends and whether or not they text significant others daily (0="Not Daily"/ 1="Daily"): "How often do you send or receive text messages with friends on your cell phone?" and "How often do you send or receive text messages with your boyfriend or girlfriend on your cell phone?" Sixth, careless mobile behavior was measured using the survey question, "Have you ever sent a text message you regretted sending?" (0="No"/1="Yes").

Seventh, schools restricting mobiles is measured using a recode of the question, "Thinking now about the rules at your school, are you allowed to have a cell phone at school at all times; or are you allowed to have a cell phone, but not in class; or are you not allowed to have a cell phone at school at any time?" (0="Not Allowed"/1="Allowed"). Eighth, two variables regarding parental influence were constructed; the first accounts for whether or not parents use texting: "Do you ever send or receive text messages on your cell phone?"

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[3] All variables used as controls when calculating probabilities were set to the mean, based upon the variables after the listwise deletion of missing values in the analysis. See Appendix A for the means and standard deviations used in such instances.

(0="No"/1="Yes"). The second measure accounts for whether or not parents place restrictions on their teenage drivers' mobile use: "Do you limit the times of day when your child can use the phone?" (0="No"/1="Yes").

Finally, for the logistic regression analysis, control variables are teenagers' gender (0="Male"/1="Female") and race (0="White"/1="Nonwhite").

Table #1: Descriptive Statistics of Teenage Drivers for Unweighted and Weighted Variables

		No N (Valid %)	Yes N (Valid %)	Total N/100%
Text while Driving	Unweighted	142 (64.0)	80 (36.0)	222
	Weighted	290 (65.6)	152 (34.4)	443
Talk on Mobile while Driving	Unweighted	101 (45.5)	121 (54.5)	222
	Weighted	204 (46.1)	239 (53.9)	443
Sent Text that Regretted Later	Unweighted	114 (51.4)	108 (48.6)	222
	Weighted	231 (52.2)	211 (47.8)	443
Parents Limiting Mobile Use	Unweighted	127 (58.8)	89 (41.2)	216
	Weighted	250 (58.7)	176 (41.3)	426
Parents Text	Unweighted	55 (26.6)	152 (73.4)	207
	Weighted	111 (27.0)	301 (73.0)	412
Mobile Allowed at School	Unweighted	63 (28.5)	158 (71.5)	221
	Weighted	128 (29.1)	313 (70.9)	441
		Not Daily **N (Valid %)**	**Daily** **N (Valid %)**	**Total** **N/100%**
Text Friend Daily	Unweighted	27 (12.2)	195 (87.8)	222
	Weighted	54 (12.1)	389 (87.9)	443
Text Significant Other Daily	Unweighted	98 (44.1)	124 (55.9)	222
	Weighted	194 (43.9)	249 (56.1)	443
Spend Time with Friends In-Person	Unweighted	141 (63.5)	81 (36.5)	222
	Weighted	287 (64.9)	155 (35.1)	443
Texts During Class	Unweighted	91 (43.5)	118 (56.5)	209
	Weighted	169 (41.0)	243 (59.0)	412
		Male **N (Valid %)**	**Female** **N (Valid %)**	**Total** **N/100%**
Gender	Unweighted	101 (45.5)	121 (54.5)	222
	Weighted	183 (41.4)	259 (58.6)	443
		White **N (Valid %)**	**Non-White** **N (Valid %)**	**Total** **N/100%**
Nonwhite	Unweighted	177 (80.8)	42 (19.2)	219
	Weighted	355 (81.4)	81 (18.6)	436

		Mean	SD	Min	Max	Total
Number of Texts Send/Receive per Day	Unweighted	116.68	117.49	0	500	216
	Weighted	139.74	137.17	0	500	427

4. Results

The descriptive statistics, from Table #1, suggest that over 34% (34.4%) of teenage drivers in the U.S. text while they drive. Additionally, nearly 54% (53.9%) of them talk on the mobile while driving. According to the 2x2 cross-tabulation in Table #2, consistent with H_1, teenage drivers who talk on the mobile while driving are over 17 times more likely to text while driving than those who do not talk on the mobile while driving (*OR*=17.22); moreover, teenage drivers who talk on the mobile while driving have about a 58% ($P[_{txt\ drv|\ tlk\ drv}]$=.577) chance of texting while driving, whereas those who do not talk on the mobile while driving text have just under an 8% ($P[_{txt\ drv|\ no\ tlk\ drv}]$=. 074) chance of texting while driving (χ^2=123.59; p<.001).

Table #2: Cross-Tabulation of Talking on the Mobile while Driving and Texting while Driving among Teenagers (weighted n=443)

		Talking on Mobile while Driving	
Texting while Driving		No	Yes
	No	189	101
		(.926)	(.423)
	Yes	15	138
		(.074)	(.577)
	Total	204	239
		(1.00)	(1.00)
χ^2	123.59***		
		95% C. I.	
OR	17.22	9.59, 30.90	

Note: Probability reported in parentheses.
* p<.05; ** p<.01; *** p<.001

The logistic regression analysis in Table #3 models the impact of various mobile behaviors and parental and educational factors on the likelihood of texting while driving (*model* χ^2=102.08; p<.001). The independent variables explain around 34% of the variance in the likelihood of teenagers texting while driving (*Nagelkerke* r^2=.34).

First, based upon the descriptive statistics, 59% of teenage drivers exchange texts during class. According to the logistic regression analysis, consistent with H_2, teenage drivers who text during class are two times more likely to text while driving than those who do not text during class (*OR*=2.11; *Wald* χ^2=7.11; p<.01). Whereas teenage drivers who text during class have about a 41% ($P[_{txt\ drv|\ txt\ clss}]$=.405) chance of texting while driving, those who do not text during class have just over a 24% ($P[_{txt\ drv|\ no\ txt\ clss}]$=.243) chance of texting while driving.

Second, the descriptive statistics suggest that over 35% (35.1%) of teenage drivers spend time daily with friends in-person outside of school, and, according

to the logistic regression analysis, and consistent with H_3, teenage drivers who spend time daily with friends in-person outside of school are two times more likely to text while driving than those who do not spend time daily with friends outside of school (*OR*=2.28; *Wald* χ^2=9.28; $p<.01$). In fact, teenage drivers who spend time daily with friends outside of school have just over a 45% ($P[_{txt\ drv|\ f2f\ dly}]$=.454) chance of texting while driving, and teenagers who do not spend time daily with friends outside of school have about a 27% ($P[_{txt\ drv|\ no\ f2f\ dly}]$=.268) chance of texting while driving.

Third, the average number of texts exchanged per day among teenage drivers is just under 118 ($\bar{x}$=117.49; *s*=137.17), yet, consistent with H_{4a}, the number of text messages exchanged per day does not have a statistically significant impact on the likelihood of texting while driving. Moreover, although about 88% (87.9%) of teenage drivers exchange texts with friends daily and just over 56% (56.1%) exchange texts daily with significant others, only daily text exchanges with significant others increases the likelihood of texting while driving. That is, while texting friends daily (H_{4b}) does not have a statistically significant impact on the likelihood of texting while driving, teenage drivers who text boyfriends/girlfriends daily (H_{4c}) are, in fact, 99% more likely to text while driving than those who do not text boyfriends/girlfriends daily (*OR* =1.99; *Wald* χ^2=6.24; $p<.05$). Although teenage drivers who do not text boyfriends or girlfriends daily have about a 26% ($P[_{txt\ drv|\ no\ txt\ sgoth}]$=.255) chance of texting while driving, teenage drivers who do exchange texts daily with such significant others have about a 41% ($P[_{txt\ drv|\ no\ txt\ sgoth}]$=.405) chance of texting while driving.

Fourth, nearly 48% (47.8%) of teenagers send texts that they later regretted. Consistent with H_5, the logistic regression analysis suggests that those who sent texts that they later regretted are three times more likely to text while driving than those who have not sent regretful texts (*OR*=3.92; *Wald* χ^2=24.95; $p<.001$). Teenagers who have not sent texts they later regretted had just over a 20% ($P[_{txt\ drv|\ no\ rgrt}]$=.202) chance of texting while driving; however, teenagers who have sent texts they later regretted had a nearly 50% ($P[_{txt\ drv|\ rgrt}]$=.499) chance of texting while driving.

Furthermore, school policies and parental involvement impact the likelihood of texting while driving, yet not entirely as predicted. First, the descriptive statistics suggest that about 71% (70.9%) of teenage drivers attend schools within which mobiles were not restricted. However, according to the logistic regression analysis, contrary to H_6, teenage drivers who attend schools that allow the use of mobiles on campus are about 61% less likely to text while driving than those who attend schools that prohibit mobile use on campus (*OR*=.39; *Wald* χ^2=10.13; $p<.001$). Moreover, teenage drivers attending schools that do not restrict mobiles have about a 28% ($P[_{txt\ drv|\ no\ rstrct}]$=.279) chance of texting while driving, while those attending schools that have restrictions

regarding mobile use on campus have about a 50% ($P[_{\text{txt drv}|\text{ rstrct}}]$=.495) chance of texting while driving. Second, over 73% of parents exchange texts, and their use, contrary to H_7, is related to a decrease in the likelihood of their teenagers texting while driving. Specifically, teenage drivers whose parents text are 45% less likely to text while driving than those whose parents did not text (*OR*=.55; *Wald* χ^2=4.15; p<.05). Teenage drivers whose parents use texting have about a 30% ($P[_{\text{txt drv}|\text{ prt txt}}]$=.296) chance of texting while driving, whereas those whose parents do not use texting have just over a 43% ($P[_{\text{txt drv}|\text{ no prt txt}}]$=.433) chance of texting while driving. Moreover, over 41% (41.3%) of teenage drivers' parents place limitations on their mobile use, and, consistent with H_8, such restrictions have a positive impact on decreasing the likelihood of them texting while driving. That is, teenage drivers whose parents limit their mobile use are 49% less likely to text while driving than those whose parents did not limit their mobile use (*OR*=.51; *Wald* χ^2=6.01; p<.05). Specifically, teenage drivers whose parents place limitations on their mobile use have a 25% ($P[_{\text{txt drv}|\text{ prt lim}}]$=.250) chance of texting while driving, whereas those whose parents do not place limitations on their mobile use have about a 40% ($P[_{\text{txt drv}|\text{ no prt lim}}]$=.395) chance of texting while driving.

Finally, regarding the control variables, although male and female drivers did not have a statistically significant difference in the likelihood of texting while driving, nonwhite teenage drivers were 71% less likely to text while driving than those who were white (*OR*=.29; *Wald* χ^2=8.07; p<.01). However, of notable importance is the statistically insignificant impact of the number of texts exchanged per day on the likelihood of texting while driving.

Table #3: Logistic Regression Analysis of the Likelihood of Teenagers Texting While Driving (weighted n=354)

	β (SE)	OR	95% C.I.
Texts During Class	.75**	2.11	1.22, 3.67
	(.28)		
Spend Time with Friends In-Person	.82**	2.28	1.34, 3.86
	(.27)		
Number of Texts Send/Receive per Day	-.01	.40	.99, 1.00
	(.00)		
Text Friend Daily	.89	2.44	.74, 8.05
	(.61)		
Text Boyfriend/Girlfriend Daily	.69*	1.99	1.16, 3.43
	(.28)		
Sent Text that Regretted Later	1.37***	3.92	2.29, 6.70
	(.27)		
Mobile Allowed at School	-.93***	.39	.22, .70
	(.29)		
Parents Text	-.60*	.55	.31, .98
	(.29)		
Parents Limiting Mobile Use	-.67*	.51	.30, .88
	(.27)		
Control Variables:			
Female	-.12	.89	.52, 1.51
	(.27)		
Nonwhite	-1.24**	.29	.12, .68
	(.44)		
Constant		-1.55*	
		(.65)	
Model χ^2		102.08***	
Nagelkerke R^2		.34	
-2LL		369.31	

* p<.05; ** p<.01; *** p<.001

5. Discussion

5.1. Theoretical Implications

This study provides considerable evidence that general mobile behaviors, sociability, parental involvement, and school policies impact the likelihood of teenagers texting while driving. Specifically, the findings point to a culture characterized by perpetual contact via mobiles (Hanson, 2007; Katz & Aakhus, 2002; Turkle, 2008). That is, youth are socialized into a culture in which close others are, or, at least, they feel should be, constantly available to them and they are, or at least, they feel they are, constantly available to others; moreover, through informal early-socialization, teenagers internalize the simultaneous management of the mobile within various social environments as normative (Baron, 2008; Gergen, 2002; Horstmanshof & Powers, 2005; Katz & Aakhus,

2002; Plant, 2001; Turkle, 2008; Wei & Lo, 2006). Consequently, this sense of constant connection cuts across all physical spaces.

First, mobile multiplexing is an issue that must be addressed when considering the mobile use when driving. The support for H_1 provides strong evidence that mobile use is not, by any means, restricted to texting while driving and that mobile multiplexing is a clear issue that demands additional attention by all stakeholders (e.g., researchers, policymakers, campaigns, mobile technology companies, automotive industry). With over a third of teenager drivers texting and more than half talking on the mobile while driving, and with likelihood of texting while driving increasing dramatically among those who to talk on the phone while driving, it is very likely that teenage drivers are also using other mobile media (e.g., SNSs) for communicating with others while driving. Teenager are unlikely to use mobiles in a dichotomous (e.g., only use text or only use phone calls) or sequential manner (e.g., use text before switching to a phone call or switching to a SNS). Instead, they are likely to fluidly move between the various media based upon the relative utility or access to certain others. This type of complex mobile multiplexing, of course, means that many new laws focusing exclusively on texting while driving are already antiquated. Moreover, it is no longer sufficient for automobile and mobile technology manufactures to work toward designing technology that will either discourage or otherwise safely accommodate texting while driving. The focus must move toward considering solutions for mobile Internet-based media (e.g., email, SNSs, photo-sharing applications) as well as (now) traditional digital mobile use (i.e., text and phone call). However, to find such solutions, additional research is necessary to explore the extent to which teenage drivers engage in other forms of mobile multiplexing while driving (e.g., reading or posting to SNSs, viewing or posting to photo-share applications, playing mobile games with friends).

Mobile multiplexing appears to reflect a much larger shift in the way teenagers experience the social world. Mobiles are not simply devices used by attention-challenged, undisciplined teenagers; rather, they reflect a shift from corporeal copresence (i.e., face-to-face interaction) (Zhao, 2005; Goffman, 1963) primacy to a mutable self (Zurcher, 1977) within an interstitial copresence, characterized by a sense of constant remote connection blended with corporeal copresence (Seiler & Kidwell, 2016). Many teenagers do not cognitively exist within a singular physical social space; instead, their cognitive involvement is spread across a vast array of digital social spaces where friends and significant others are always assumed to be digitally copresent. Consequently, their behaviors within physical spaces reflect this type of bi-psyche (Plant, 2001). Although the data in this study did not allow for thorough analysis of this theory, the test of H_2 provided some support for the claims. That is, teenagers who text during class were more likely to text while driving, which suggests that these teenage are

unlikely to feel a cognitive divide between their physical social interactions and their digital social interactions. Accordingly, they are able to continue digital social interactions as they move between and navigate various physical social spaces (e.g., class, work, dinner, driving). However, the consequence of mismanagement of digital social interactions and physical social interactions while driving are severe – and potentially fatal.

Moreover, the findings here suggest that teenagers tend to experience digital social interactions as only qualitatively different than face-to-face interactions. Accordingly, the test of H_3 found that teenagers who spend time with friends face-to-face daily were more likely to text while driving than those who do not spend time with friends, face-to-face, daily. In other words, this test gives credence to the argument that teenagers who are more social with their peers are so within both physical and digital spaces.

However, texting while driving among teenagers is not a zero-sum game; that is, it is not as simple as assuming they either text while driving or they do not text while driving, nor, as predicted in H_{4a}, is it as simple as assuming that those who use texts more often are more likely to text while they drive. Although many teenagers acknowledge the dangers of texting while driving is dangerous (Hafetza et al., 2010; Harrison, 2011), the number of texts exchanged per day did not have statistically significant impact on the likelihood of texting while driving. However, as we argued in H_{4b} and H_{4c}, teenage drivers are more likely to text *certain people* while driving – a claim that was partially supported. That is, although, contrary to H_{4b}, we did not find support for the claim that teenage drivers who exchanged texts with friends daily would be more likely to text while driving than those who did not exchange texts with friends daily, teenage drivers who texted significant others (i.e., boyfriends or girlfriends) daily, consistent with H_{4c}, were more likely to text while driving than those who did not did not text significant others daily. We feel this reflects teenagers' prioritization of relationships, with those relationships within which they feel they have the largest emotional self-investment receiving the most – and most immediate – attention. Therefore, although teenage drivers are likely, if asked, to agree that texting while driving is unsafe, the demand felt by teenage drivers to reply immediately to texts from those to whom they are most self-invested (Seiler & Kidwell, 2016; Horstmanshof & Powers, 2005) is likely to situationally, and even just momentarily, take priority over their feelings regarding the dangers of texting while driving.

In fact, teenagers who tend to be a bit careless in their texting behaviors are even more likely to text while driving. In support of H_5, we found that teenage drivers who have sent text messages they regretted later were much more likely to text while driving than those who have not sent text messages they regretted. This finding suggests that texting while driving is not simply a consequence of

teenagers unthinkingly internalizing culture and unreflectively acting accordingly. Rather, it is likely a reflection of the process through which teenagers develop a maturity of judgment. Although additional research into forms of technological deviance or simply carelessness is necessary to fully understand the extent of the impact of such behaviors on the likelihood of texting while driving, we feel our finding confirms that mindful technology use is related to decreased likelihood of texting while driving. Therefore, educating teenagers about the proper, responsible use of mobiles, generally, is of critical importance. We believe we can learn from anti-smoking campaigns. Although we might not be able to directly associate the many television commercials, fliers, public speaking events, et cetera, with the decline in cigarette smoking among teenagers, such campaigns, over time, begin to resonate on a cultural level. That is, over the years, the messages that such campaigns widely disseminate took hold within a public consciousness. To this end, we feel proper and responsible mobile use must continue to receive attention within the education system and campaigns for responsible mobile use should continue to receive funding.

The findings associated with H_6, H_7, and H_8 provide some context for understanding the impact of authority figures on the likelihood of texting while driving. First, we interpret the contrary findings related to H_6 as a cautionary note for educators and education administrators. That is, teenage drivers attending schools in which mobiles are restricted are more likely to text while driving than those who attend schools within which mobiles are not restricted. In fact, the probability of texting while driving among teenagers who attend schools with restrictive mobile use policies is substantially higher than the probability of texting while driving among teenagers who attend schools without restrictive mobile use policies. Consistent with the previous argument regarding interstitial copresence, we feel that many teenage drivers are going to find ways to exchange texts with close others regardless of rules prohibiting mobile use. However, since teenage drivers at schools with restrictive policies have to find clandestine ways of using their mobiles, they are likely to compensate after or before school. Rather than interpreting this as a form of sheer defiance against the rules, we suggest that this finding might reflect no-use policies based upon an antiquated logic or an antiquated commonsensical logic that students who cannot refrain from using the mobile at school are, for example, undisciplined. However, although the findings here provide indications that restrictive school policies might actually be a bit counterproductive, since the variable used in this analysis only accounts for whether or not the teenage drivers' schools have restrictions on mobile use on campus, additional research examining the qualitative differences in the mobile use policies schools employ, the qualitative dynamics of mobile use in class, and the impact these factors have on the likelihood of texting while driving is

necessary to fully understand the complexities involved in the connection between schools' mobile use policies and teenagers driving behaviors.

Second, H_7 and H_8 suggest that parents do have an impact on their teenagers' driving behaviors – both indirectly and directly. On the one hand, contrary to H_7, teenage drivers whose parents text are less likely to text while driving than teenage drivers whose parents do not text, which suggests that parents who are also entrenched within this mobile culture might be able to relate with their teenagers more closely than parents who do not use mobiles beyond possibly talking on the phone. Moreover, it is also possible that teenagers observe their parents engaging proper (e.g., abstaining from texting while driving) or improper mobile use (e.g., texting while driving), which influences their decisions to refrain from texting while driving. On the other hand, consistent with H_8, the findings suggest that parents' active regulation of their teenager's mobile use does decrease the likelihood of them texting while driving, which is in line with previous research on childhood socialization that suggests cultural sanctions by authority figures positively shape teenagers' perception of authority, formal rules, and laws (Crouter & Head, 2008; Steinberg, 2000). In fact, when considering the nearly 30% difference in the probability of texting while driving between teenagers whose parents text and place restrictions on their mobile use and teenagers whose parents do not text and do not place restrictions on their mobile use, the role of parents' understanding and involvement in their teenagers' mobile use is especially critical in discouraging texting while driving.

Texting while driving shares in common with other problematic mobile use the sense of constant connection. With unfortunate mobile use-related accidents such as walking off piers (Clarke, 2012), falling into mall fountains (CBS News, 2011; Mallison, 2017), falling off cliffs (Fox News, 2015), falling into open sidewalk cellars (Associated Press, 2017), walking in front of trains (Associated Press, 2015), or walking into parked cars, into telephone poles, or in front of moving vehicles (Richtel, 2010), texting while driving is, by no means, an isolated phenomenon; moreover, such problematic mobile use is, by no means, a trivial issue. Additional social science research on the broader social context of mobile use is necessary to understand the nature of interstitial copresence and identify solutions that will reduce personal and public dangers associated with such mobile use. If researchers can identify solutions for safely managing this bi-psyche within the broader social context, then we will also have solutions for dangerous mobile use while driving.

5.2. Practical, Policy, & Design Implications

This study also has a number of implications all stakeholders (e.g, parents, policymakers, school administrations, automobile manufactures, and mobile technology designers). First, the findings here reinforce common knowledge

regarding the impact parents can have on their children's lives. Direct parental involvement, in terms of restricting their teenage drivers' mobile use, specifically, and simple proactive interest in their mobile use, generally, encourages proper, responsible, and safe mobile use. Parents who do use mobiles should, of course, exhibit responsible mobile use, themselves; however, parents who do not use mobiles– or, more specifically, do not text, should, at least, seek to understand teenage mobile culture in order to have a baseline knowledge for relating to their teenagers and encouraging proper and responsible mobile use in a manner that resonates with them. Thus, the implications of this study simply reaffirm the role and impact of responsible parenting in decreasing the likelihood of their teenagers texting while driving.

Second, the implication of this study for high school teachers and school administrators is carefully reevaluate the rules and policies regarding mobile use within the classroom as well as on campus. The findings suggest that policies at school have implications for teenagers behavior outside of school. Specifically, policies restricting mobile use on campus contribute to increased likelihood of teenagers texting while driving. Teachers and administrators could be more effective in minimizing the likelihood of texting while driving by establishing more nuanced policies that focus on proper and responsible mobile use on campus or as it relates to the classroom rather than focusing mobile use policy dichotomously on no use in class or on campus versus in-class or on-campus use. In the latter case, the emphasis would be on *how* to properly and responsibly use the mobile within various social environments, as opposed to focusing on when to and when not to use the mobile. To be clear, much of the current research on mobile communication strongly suggests that adults and teenagers, alike, use their mobiles in various environments, and rarely do they actually turn off their mobiles (Lenhardt, 2015). Instead of insisting on enforcing policies related to antiquated cultural norms, high schools should develop mobile use policies that reflect cultural trends within public and professional adult social life. Therefore, in addition to designing mobile use policies that encourage the most productive learning experience and contribute to students' safety on campus, high school teachers and administers should also consider the potential indirect impact of such policies on students' mobile use behaviors outside of school.

Third, policymakers must, too, establish more nuanced laws regarding mobile use while driving. Current texting while driving laws based upon binary deterrence logic, i.e., the more severe the sanction for violating a rule, the lower the likelihood of violating rules, have been ineffective in reducing distracted driving related accidents (Burger, Kaffine, & Yu, 2014; Highway Loss Data Institute [HLDI], 2009); in fact, evidence suggests that such text bans while driving might actually be increasing the likelihood of accidents (Ehsani, Bingham, & Ionides, 2014; HLDI, 2010). The findings here suggest that teenage drivers are

mobile multiplexing; many of them use their mobiles while negotiating both their high school classes and operating automobiles; and those who text in class are likely to have a high probability of also texting while driving. In effect, most teenagers are likely to exchange texts regardless of the environment and regardless of how strict the sanction is for doing so with certain close friends or significant others and under certain conditions. Therefore, attempting to prohibit mobile use within any public environment is unlikely to be successful. Stricter laws are only likely to increase the variety of concealment strategies teenagers who want to text while driving employ. Rather than focusing on strict text bans with hefty fines for violating such laws, policymakers should, instead, focus their efforts on funding programs and advertisement campaigns to educate – and frequently remind – teenagers about the dangers or texting while driving and encouraging, supporting, and providing financial incentives for communication technology and automobile industries to design technologies that either disallow texting while automobiles are in motion or develop more seamless voice-to-text, hands-free mobile use technologies within automobiles.

Texting, specifically, and the mobile by-psyche, generally, are organic products of cultural change within a era of advanced communication technology; therefore, teenagers develop such behaviors and perceptions of the social world through the process of socialization. As they internalize this mobile culture, it becomes normalized and, thus, difficult to change through policy. Public awareness campaigns that aim to educate and constantly remind teenagers of the risk of texting while driving as well as meaningful and realistic strategies for managing their relationships through the mobile without compromising their safety, the safety of their passengers, and the safety of others with whom they share the road while driving are likely to be the most effective approach to social change on a cultural level. Whereas laws might set formal precedents, awareness campaigns, over time, can begin to resonate with people on a cultural level. Although such campaigns are unlikely to see immediate, wide-spread effects, their messages become ingrained within our language, collective memory, and, ultimately, cultural norms (e.g., Smokey Bear, "Only you can prevent forest fire; Woodsy Owl, "Give a hoot; don't pollute; McGruff the Crime Dog, "Take a bite out of crime") (United States Department of Agriculture, 2004; Ad Council, 2017; National Crime Prevention Council, 2017).

Finally, automakers and technology manufacturers must emphasize safety more than convenience when developing in-vehicle technologies for managing mobiles. Although in-vehicle hands-free technology is attractive to potential buyers, automakers must take responsibility for contributing to technology-induced distracted driving. Rather than focusing on expanding options for in-vehicle connectivity, they should focus on refining the most basic forms of mobile

communication with emphasis on ergonomic innovations aimed at minimizing driver distractions when navigating such technology.

5.3. Limitations

Although we feel that this study provides important insights into social factors contributing to texting while driving among teenage drivers, it is important to consider the findings within the proper methodological context. First, this is a cross-sectional, secondary data analysis. Therefore, not only are our findings limited to establishing correlation, as opposed to causation, between the various selected social factors and texting while driving among teenagers, but also many of the variables used within the analyses were not ideal for fully examining the impact of these social factors on the likelihood of teenagers texting while driving. Future time-series research that accounts for how often, instead of simply whether or not, teenagers engage in various mobile activities as well as texting while driving would allow for a much deeper understanding of motivations for texting while driving among teenagers.

Second, since the objective of this study was to provide a foundation for future sociological research on texting while driving among teenagers, the single-model logistic regression analysis does not account for mediation or moderation effects of independent variables on the likelihood of texting while driving. Yet, analyzing such effects would provide for a more complex understanding of factors contributing to the likelihood of texting while driving. With such little sociological research examining texting while driving, future research of this type of research is necessary.

Third, although the weighted sample size (n=443) is sufficient for a +/-5% sampling error, at a 95% confidence level and assuming a 50/50 split, of teenage drivers living in the U.S., the post-listwise deletion sample size (n=354) used in the logistic regression would only allow for an approximate sampling error of +/-7% at a 95% confidence level. A +/-3% to a +/-5% sampling error (at a 95% confidence level) is desired when generalizing findings from a sample to the population. Therefore, additional research of a much larger, nationally-representative sample is necessary to establish an even more accurate understanding of the impact of the social structural factors addressed here on the likelihood of texting while driving among teenage drivers in the U.S..

Finally, since the data analyzed for this study are from 2009, more recent data are necessary to fully understand the current sociological nature of texting while driving among teenagers. Mobile devices have undergone major innovations, and, thus, teenagers have more mobile capabilities now than in 2009, and, with the introduction of new mobile applications, new online social media, and new mobile device features for communicating with others, it is possible that additional social factors are now present that both encourage teenagers to, and

impede them from, texting while driving. Therefore, social researchers are encouraged to use this study as a foundation and justification for conducting survey research.

6. Conclusion

Mobile communication is a defining feature of modern industrial society, and mobile technology is increasingly integrated into social life. As teenagers who are socialized into a mobile-connected social world reach driving age, the structural contradiction between a mobile society and individualized transportation society becomes increasingly apparent. This study provides evidence that texting while driving among teenagers is inherently rooted in culture, socialization, and social dynamics within everyday social life.

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9. Appendix

Appendix A: Descriptive Statistics for Weighted Variables from Listwise Deletion, Logistic Regression Analysis

	Mean	SD	Min	Max	N
Texts During Class	.58	.50	0	1	354
Spend Time with Friends In-Person	.37	.48	0	1	354
Number of Texts Send/Receive per Day	117.88	135.08	0	500	354
Text Friend Daily	.89	.31	0	1	354
Text Significant Other Daily	.54	.50	0	1	354
Sent Text that Regretted Later	.49	.50	0	1	354
Mobile Allowed at School	.73	.44	0	1	354
Parents Text	.72	.45	0	1	354
Parents Limiting Mobile Use	.41	.49	0	1	354
Female	.56	.50	0	1	354
Nonwhite	.17	.38	0	1	354

* The means presented here were used in the probability equations in which the variables were treated as controls.