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Low Self-Control, Social Learning, and Texting while Driving

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Abstract

Despite the known implications of texting while driving for reducing driver alertness and increasing traffic accidents, investigating the potential causes of the behavior is something that criminologists have only recently started to investigate. The current study builds on this small body of research by assessing whether low self-control is associated with the frequency of texting while driving and, further, whether this association is moderated by perceptions of the texting habits of other drivers and best friends. Results based on data collected from a sample of 469 young adults indicate that low self-control is positively associated with the frequency of texting while driving. In addition, this association is amplified by an individual's perceptions of the proportion of other drivers who engage in texting while driving, but not by the texting and driving habits of best friends.

Keywords

Texting while driving; Low self-control; Perceptions; Social learning

Introduction

A large body of research finds that texting while driving impedes a driver's ability to maintain attention and alertness, resulting in such things as lane drift, missing lane change cues and traffic signals, and a failure to process traffic sign information (e.g., Caird, Johnston, Willness, Asbridge, & Steel, 2014; Hosking, Young, & Regan, 2009; Owens, McLaughlin, & Sudweeks, 2011). It is perhaps not surprising, then, that individuals who more frequently engage in texting while driving are more likely to get into traffic accidents (e.g., Dingus et al., 2016; Klauer et al., 2014), with one study estimating that 25% of all traffic accidents in the U.S. are due to distracted driving habits, which include texting while

driving (Stutts, Reinfurt, Staplin, & Rodgman, 2001); 10% of traffic fatalities in 2012 were reportedly due to distracted driving (NHTSA, 2014).

In light of such evidence, identifying the causes and correlates of texting while driving is important from both a research and policy standpoint. To the extent that individual and contextual factors can be identified, policies can be implemented to try and reduce the frequency of the behavior (see Sherin et al., 2014). In this regard, studies outside of the field of criminology have investigated how traits akin to low self-control (e.g., impulsivity), as well as indicators of parental and peer behavior consistent with social learning principles, account for variation in texting while driving (e.g., Billieux, Van der Linden, & Rochat, 2008; Gupta, Burns, & Boyd, 2016; Hayashi, Rivera, Modico, Foreman, & Wirth, 2017; Nemme & White, 2010). Little attention, however, has been directed at investigating the causes of texting while driving by criminologists. We are aware of only three studies using criminological frameworks that have examined the potential causes of texting while driving (Gray, 2015; Green, 2017; Quisenberry, 2015); only one of these studies appears in a peer-reviewed journal (Quisenberry, 2015).

Considering that criminologists routinely attempt to use theoretical mechanisms to explain deviant and analogous behaviors, the lack of attention provided to texting while driving is relatively surprising. Explicitly, texting while driving *is* a deviant behavior analogous to many outcomes that criminologists routinely attempt to explain. Accordingly, texting while driving is a behavior that should be theoretically investigated by criminologists. Developing a more theoretically-oriented viewpoint into texting while driving could help develop and hone programs aimed at stopping a social behavior that claims the lives of up to 3300 Americans every year (NHTSA, 2014, 2016). Beginning such a line of research with established theories like self-control and social learning is ideal since these two theories are established as among the best – if not the best – theoretical orientations that criminologists have at their disposal. Beyond just the scope of this study, however, we emphasize that the outcome of texting while driving provides a unique opportunity to criminologists to make a real, observable impact to the protection of life in an applied setting. Simply put, theoretical research is badly needed to develop an understanding of the processes which lead to the onset, continuance, and desistance from texting while driving.

Given the dearth of attention devoted to investigating the potential causes of texting while driving within the criminological literature, a clear void exists. In this study, we add to this body of research by focusing on self-control (Gottfredson & Hirschi, 1990) and social learning (Akers, 2009) concepts as predictors of texting while driving. Specifically, we investigate two issues. First, we consider whether low self-control is positively associated with the frequency of texting while driving. While on its face this might seem like a self-evident association, of the three criminological studies that have examined the link between low self-control and texting while driving, only one found support for this association (Quisenberry, 2015) while two others did not (Gray, 2015; Green, 2017). As such, the relevance of self-control for understanding patterns of texting while driving remains unsettled.

Second, we consider whether the effect of low self-control on texting while driving is amplified by a person's perceptions of the texting and driving habits of other drivers in general, as well as best friends specifically. To our knowledge, a consideration of moderating effects between individual traits (i.e., impulsivity, low self-control) and social learning processes (e.g., parental and peer behavior) when seeking to explain texting while driving is not something which any study, criminological or otherwise, has considered. As such, the current study contributes to the literature on the potential causes of texting while driving in a number of ways. Prior to discussing the current study, we first provide an overview of prior theory and research.

Literature Review

Self-Control, Social Learning, and Moderating Effects

Before the theories of self-control (Gottfredson & Hirschi, 1990) and social learning (Burgess & Akers, 1966) were developed, Reiss (1951) established the importance of both learning and control-based approaches to explaining crime. Despite Reiss seeing the different approaches as being complementary to one another, the authors of self-control theory and social learning theory have repeatedly stressed that the approaches are fundamentally different (see Akers, 1991; Hirschi & Gottfredson, 2000). The reason for the disagreement is a set of opposing beliefs about the underlying causes of antisocial behavior. According to self-control theory, antisocial behavior is innate and must be controlled through the proper development of self-control, whereas social learning theory contends that antisocial behavior is not an inherent part of human nature. Instead, the theory argues that deviance – like all other behavior – is learned through interactions with others (see Akers, 2009). Despite the theories being very different in their underlying assumptions, both have received a considerable amount of empirical support in regard to their ability to explain a wide range of antisocial behaviors (Pratt et al., 2010; Vazsonyi, Mikuška, & Kelley, 2017), with evidence that variables from both theories exhibit concurrent effects on delinquency and crime that are similar in magnitude (Pratt & Cullen, 2000).

As the debate between the two theories has continued, the focus has evolved. Instead of focusing on *whether* each of the theories explain antisocial behavior, the research has shifted to which theory explains crime the best (see Vazsonyi et al., 2017) and if variables from the two theories relate to deviance in both independent (i.e., main effects) and interdependent (i.e., interactive) ways. For example, Chapple (2005) found that low self-control was a key cause of developing ties to deviant peers, a construct central to social learning theory (see also McGloin & Shermer, 2009). Chapple also found evidence that peer relationships mediated the effect of self-control on delinquency. At the same time, other studies have pointed to the significance of associating with deviant peers in contributing to changes in self-control (e.g., Burt, Simons, & Simons, 2006; Meldrum, Young, & Weerman, 2012). Thus, it may be that self-control and social learning processes are mutually reinforcing over time.

Other studies have investigated the interaction between self-control and social learning variables when seeking to explain antisocial behavior. For example, studying workplace deviance, Gibson and Wright (2001) found the effect of low self-control on occupational

deviance was amplified by coworker deviance. A similar conclusion was reached by Hirtenlehner, Pauwels, and Mesko (2015) and Wright, Caspi, Moffitt, and Silva (2001) when focused on criminal behavior. Despite such evidence of an amplification effect, other studies report that peer delinquency has a stronger effect on antisocial behavior when self-control is higher (Meldrum, Young, & Weerman, 2009). Still other studies fail to find evidence of an interactive effect between self-control and peer behavior (e.g., McGloin & Shermer, 2009; Yarbrough, Jones, Sullivan, Sellers, & Cochran, 2012). Overall, research in this area yields mixed results, leaving open the question of whether self-control and peer deviance truly interact with one another (see also Ousey & Wilcox, 2007).

Self-Control, Social Learning, and Texting while Driving

Despite the importance of self-control and social learning theories in the etiology of deviance, few studies have used theoretically informed approaches to understanding the causes of texting while driving; even fewer appear in the criminological literature. While some studies have assessed the relationship between self-control or related constructs (e.g., impulsivity) and texting while driving (Billieux et al., 2008; Gray, 2015; Green, 2017; Gupta et al., 2016; Hayashi et al., 2017; Panek, Bayer, Dal Cin, & Campbell, 2015; Quisenberry, 2015; Struckman-Johnson, Gaster, Struckman-Johnson, Johnson, & May-Shinagle, 2015), others have studied how variables relevant to social learning theory relate to texting while driving (Bazargan-Hejazi et al., 2017; Gray, 2015; Green, 2017; Gupta et al., 2016; Nemme & White, 2010; Rodriguez, 2014).

Results from the studies focused on self-control and related constructs provide some evidence, albeit mixed, that low self-control increases one's tendency to engage in texting while driving. On the one hand, some studies report a significant effect that is consistent with self-control theory's expectations that people with lower self-control should be more likely to text and drive (Billieux et al., 2008; Hayashi et al., 2017; Panek et al., 2015; Quisenberry, 2015; Struckman-Johnson et al., 2015). Yet, other studies find that low self-control has a minimal influence on texting while driving. For example, using the self-control scale developed by Grasmick, Tittle, Bursik Jr, and Arneklev (1993), Gray found among a sample of over 2000 adults that the bivariate relationship between low self-control and a dichotomous measure of texting while driving was reduced to non-significance in a multivariate model. Also using the Grasmick et al. scale, Green (2017) found no relationship between texting while driving and self-control in a multivariate model.

Of the texting while driving studies including measures reflecting differential association (Sutherland, 1947) and/or social learning (Akers, 2009) constructs in their models, the results are also mixed. Rodriguez (2014) and Bazargan-Hejazi et al. (2017) found that perceptions of peer and parent texting while driving behaviors are positively associated with texting and driving (see also Gupta et al., 2016). Nemme and White (2010), however, found that perceptions of peer texting while driving practices were related to one's intentions of texting and driving but not the actual behavior. Contrary to other studies, Gray (2015) found that while more frequent parental texting while driving is related to young adult texting while driving at the bivariate level, this association was reduced to non-significance in a multivariate model. Likewise, Green (2017) found no evidence that either peer or parental

texting while driving behavior was associated with texting while driving in multivariate models. Overall, similar to the literature assessing the interactive relationship between self-control and social learning variables, the body of research assessing the utility of self-control and social learning concepts for explaining texting while driving is also mixed. These observations call attention to the goals of the current study.

The Current Study

Past research offers mixed evidence regarding: 1) the interaction between low self-control and peer deviance in the prediction of antisocial behavior, and 2) the importance of self-control and social learning concepts for understanding texting while driving. With the exception of the recent study by Quisenberry (2015) based on a convenience sample of 227 young adults, there are no other criminological studies investigating the causes of texting while driving that appear in peer reviewed journals (Green's, 2017 study was a thesis, and Gray's, 2015 study was a dissertation) despite the mountain of evidence speaking to the large societal costs of texting while driving. The current study aims to build on the study by Quisenberry (2015) and add to the literature investigating the causes of texting while driving by testing three hypotheses.

First, we hypothesize that individuals who are lower in self-control will engage in more frequent texting and driving. Texting while driving reflects a choice to engage in a behavior which is not only recognized as contributing to fatal and non-fatal traffic accidents but is also illegal in 47 states in the U.S. ("Distracted Driving, 2018). Choosing to send or read text messages, then, reflects risky, impulsive decision-making with a lack of adequate consideration given to the potential consequences of the behavior, and these are qualities that reflect a lack of self-control (Gottfredson & Hirschi, 1990).

Second, we hypothesize that the effect of low self-control on texting while driving will be amplified by an individual's perception that a greater proportion of other drivers engage in texting while driving on a regular basis. While consideration of an interactive effect between low self-control and a generalized peer group (as opposed to one's friends) has not been examined in past research, we argue here that perceiving a greater proportion of other people engage in texting while driving serves as a definition favorable toward texting while driving that would lead some to feel that, "If everyone else is doing it, then why shouldn't I?" While individuals who are high in self-control may be less affected by the perceived texting and driving habits of others because they recognize the risks and think about the consequences of the behavior, individuals who are low in self-control may feel "freed" to engage in the behavior precisely because they think more people are doing it. Thus, we anticipate that the effect of low self-control on texting while driving will be amplified among individuals who perceive more drivers engage in texting while driving.

Third, we hypothesize the effect of low self-control on texting while driving will be amplified by the perception that one's best friend engages in more frequent texting while driving. This hypothesis is not unlike those tested in past studies which have examined the interactive relationship between low self-control and peer delinquency (e.g., McGloin & Shermer, 2009; Meldrum et al., 2009), but no study to date has considered the interactive relationship between self-control and peer behavior when predicting texting and driving.

Consistent with the logic of the second hypothesis described above, having a very close friend who more frequently engages in texting while driving would provide a definition favorable toward texting while driving and positively reinforce the behavior, and individuals who are lower in self-control should be more susceptible to such reinforcement and therefore engage in more frequent texting while driving relative to individuals who are higher in self-control.

Method

Participants and Procedure

To test our hypotheses, data were collected from a convenience sample of 469 individuals recruited on college/university campuses located in southeast Florida. The average age of the sample is 24.0 years. The sex composition is split evenly, and slightly more than half of the participants (57%) indicated they were White and Hispanic, which is a consequence of the recruitment area. To gather the data, trained graduate students invited individuals to voluntarily participate in an in-person survey interview with closed-ended questions/items on multiple college and university campuses in March of 2017. Participants did not have to be students attending the colleges or universities where recruitment was taking place, but it is assumed the vast majority of participants were students.

Each person that was approached was asked if they would like to participate in a study on driving behavior by responding to a series of questions. They were told that participation would take approximately five to ten minutes, that participation was voluntary, that the information they provided would not be shared with anyone other than the research team, and that no personally identifying information would be recorded (i.e., name, date of birth, phone number, etc.). To ensure the anonymity of the participants, verbal consent was obtained from each participant rather than written consent. Of the 615 individuals who were approached to participate in the study, 480 agreed to the in-person survey interview, yielding a participation rate of 78%. Complete data for each of the measures described below was available for 469 individuals.

Measures

Texting while Driving

To measure frequency of texting while driving, participants were asked the following question: "In the past 30 days, when you have driven and you were not stopped at a traffic light, on how many separate drives did you text-message others or use your phone for something other than placing a phone call? The following response options were provided: "Never" (= 0), "1 to 5 Drives" (= 1), "6–10 Drives" (= 2), "11–15 Drives" (= 3), "16–20 Drives" (= 4), "21–25 Drives" (= 5), "26–30 Drives" (= 6), "31–35 Drives" (= 7), "36–40 Drives" (= 8), and "41 or More Drives" (=9). The decision was made to make specific reference to texting while not stopped at a traffic light given that the law concerning texting while driving in Florida allows for the behavior when the vehicle is not in motion. Further, given the potential that hundreds of individual texts could be sent and/or read over the course of a 30 day period, we chose to reference engaging in the behavior on separate drives to

reduce memory recall error. As shown in Table 1, the mean score was 3.68, indicating that the average participant engaged in texting while driving on more than 11–15 separate drives in the past month. Of further interest, 90% of participants reported having engaged in texting while driving at least once in the past 30 days, which is consistent with other recent samples of college students (e.g., Hill et al., 2015). The descriptive statistics for all variables are displayed in Table 1; the correlation matrix can be found in Appendix Table 4.

Low Self-Control

To measure low self-control, six items from the Grasmick et al. (1993) self-control scale were read to participants. The six items pertained to the impulsivity and risk-seeking dimensions of low self-control and were modified to reflect the fact that the items were being read aloud to the participants: “You often do whatever brings you pleasure here and now at the cost of some distant goal,” “You are more concerned with what happens to you in the short run than in the long run,” “You like to test yourself every now and then by doing something a little risky,” “Sometimes you will take a risk just for the fun of it,” “You sometimes find it exciting to do things that could get you into trouble,” and “Excitement and adventure are more important to you than security.” Responses for each of the six items were as follows: “Strongly Disagree” (= 1), “Disagree” (= 2), “Agree” (= 3), and “Strongly Agree” (= 4). The average of the six items was taken and the original direction of the coding was maintained so that higher scores reflect lower in self-control ($\alpha = 0.78$).¹

Perceptions of Other Drivers’ Texting while Driving Habits

To measure perceptions of other drivers’ texting while driving habits, participants were asked to respond to the following question: “Out of every 10 drivers on the road, how many of them do you think engage in texting while driving on a regular basis?” Participants were asked to provide a number between zero and 10, with higher scores indicating that a participant felt a greater proportion of drivers engage in texting while driving on a regular basis. Of note, the mean score for the sample was 7.15, with a standard deviation of 1.90. Thus, the average participant felt that greater than 70% of other drivers engage in texting while driving on a regular basis, but there was variability around this average. It is this difference in perception between individuals which we anticipate will condition the effect of low self-control on texting while driving. While it is not common for criminological studies to focus on the potential influence of strangers on respondent behavior, research does provide evidence that even strangers can influence behavior (e.g., Paternoster, McGloin, Nguyen, & Thomas, 2013).

Perceptions of Best Friend Texting while Driving Habits

To measure perceptions of best friend texting while driving habits, participants were asked to respond to the following question: “When your closest friend, which can include your

¹To encourage participation in the study by keeping the in-person survey interviews brief, we chose not to include the full 24-item measure of low self-control developed by Grasmick et al. (1993). With regard to the choice to assess impulsivity and risk-seeking in particular, this was guided by prior research suggesting that these dimensions of self-control are more strongly associated with antisocial behavior than other dimensions (see Longshore, Rand, & Stein, 1996; Piquero & Rosay, 1998). In addition, multiple studies testing self-control theory have been based on the use of composite measures of only impulsivity and risk-seeking items (e.g., Higgins, Jennings, Tewksbury, & Gibson, 2009; Schreck, Stewart, & Fisher, 2006).

spouse, drives and is not stopped at a traffic light, how often does he or she text-message others or use their cell phone for something other than placing a phone call?" Response options were as follows: "Never" (= 1), "Rarely" (= 2), "Sometimes" (=3), "Often" (= 4), and "Always" (= 5). The mean score for the sample was 3.30, indicating that the average participant felt their best friend engaged in texting while driving slightly more than sometimes. The standard deviation of 1.01, however, makes clear that there is variability between participants in their perception of how frequently their best friend engages in texting while driving. Again, it is this variability in perception which we anticipate will condition the association between low self-control and the frequency of texting while driving.

Wrongfulness of Texting while Driving

Prior research indicates that personal attitudes concerning texting while driving are correlated with both intentions to engage in texting while driving (Gauld, Lewis, White, Fleiter, & Watson, 2017) and actual texting while driving (Nemme & White, 2010). Given this, we include a measure of the respondent's attitude concerning how wrong it is to text while driving. Specifically, the question read: "How much do you disagree or agree that it is wrong to text message or use your phone for something other than making a phone call while driving a car?" Response options were as follows: "Strongly Disagree" (= 1), "Disagree" (= 2), "Agree" (= 3), and "Strongly Agree" (= 4).

Demographics

The birth year of participants was recorded and then subtracted from the numerical value of 2017 to measure age. To measure race/ethnicity, participants were asked "which one of the following categories best describes your race and/or ethnicity?" Options were: "White and non-Hispanic," "White and Hispanic," "African American and Non-Hispanic," "African American and Hispanic," "Asian," "American Indian or Alaskan Native," "Native Hawaiian or Pacific Islander," and "Other." For the analysis, we constructed four dummy variables for White and Hispanic (57%, the reference category), White and non-Hispanic (13%), African American and non-Hispanic (19%), and Other (11%). This last dummy variable for "other" included participants who selected "African American and Hispanic," "Asian," "American Indian or Alaskan Native," "Native Hawaiian or Pacific Islander," and "Other." The interviewers recorded the sex of each participant on their own at the completion of the survey. For the analysis, Male is coded 1 and Female 0.

Analytic Method

To test our first hypothesis concerning the association between low self-control and the frequency of texting while driving, we estimate a series of OLS regressions.² We begin with a bivariate regression where low self-control is modeled as the sole predictor of the

²There is no clear standard for the minimum number of values required for a dependent variable to be considered continuous and for OLS regression to be used as a modeling strategy. The dependent variable is measured on a 10-point ordinal scale, and some researchers may view the use of OLS regression as inappropriate. As a sensitivity check, each of the models described in the results section were re-estimated when using ordered logistic regression as an alternative to OLS regression (the Brant test indicated the parallel regression assumption was not being violated for the model as a whole). These ordered logistic regression models (available on request) produced results that were substantively identical to those reported in the results section, increasing our confidence that the findings are not merely a consequence of modeling strategy.

frequency of texting while driving in order to establish a baseline association. Next, we add to the model demographic variables, followed by each of the other variables reflecting perceptions of others' texting while driving habits and the participant's own attitude concerning the wrongfulness of texting while driving. To test our second and third hypothesis, we introduce multiplicative interaction terms to the OLS model to assess whether the effect of low self-control on the frequency of texting while driving is moderated by perceptions of other drivers' texting while driving habits and perceptions of best friend texting while driving habits. To reduce the risks of multicollinearity, the measures of low self-control, perceptions of other drivers' texting while driving habits, and perceptions of best friend texting while driving habits were each standardized prior to estimation of each of the aforementioned models. Following the presentation of the main results, supplementary models are then described which further probe the nature of the association between low self-control and texting while driving. All models for the analysis were estimated using STATA 14.2.

Results

Table 2 presents the results of the series of OLS regression models estimated in order to test our hypotheses. Model 1 indicates there is a statistically significant, positive association between low self-control and the frequency of texting while driving, with a standardized effect size of 0.19 ($p < .001$). This establishes a baseline association which can be used as a point of comparison relative to subsequent models. Model 2 adds the demographic variables to account for differences in age, sex, and race. As shown, the effect of low self-control remains virtually unchanged when these variables are added to the model ($\beta = 0.18, p < .001$). The model also indicates that older drivers are less likely to engage in greater texting while driving ($\beta = -0.12, p < .01$), but there are no statistically significant effects for sex or race.

Model 3 introduces the variables measuring perceptions of other drivers' texting while driving habits, perceptions of best friend texting while driving habits, and attitudes about the wrongfulness of texting while driving. Even with the addition of these variables to the model, the effect of low self-control remains statistically significant ($\beta = 0.15, p < .01$), providing support for our first hypothesis. The model also shows that perceptions of other drivers' texting while driving habits ($\beta = 0.15, p < .001$) and perceptions of best friend texting while driving habits ($\beta = 0.25, p < .001$) are each positively associated with the frequency of texting while driving. Conversely, attitudes about the wrongfulness of texting while driving ($\beta = -0.23, p < .01$) and age ($\beta = -0.09, p < .05$) are negatively associated with the frequency of texting while driving.

Model 4 introduces the multiplicative interaction terms to test hypothesis two and three. As shown, there is a statistically significant, positive effect for the interaction term between low self-control and perceptions of other drivers' texting while driving habits ($\beta = 0.11, p < .01$). This provides support for our second hypothesis concerning the anticipated amplification effect – individuals who are lower in self-control are significantly more likely to engage in greater texting while driving if they perceive that a greater proportion of other drivers regularly engage in texting while driving. While support for this hypothesis was found,

Model 4 fails to provide support for our third hypothesis. Specifically, the multiplicative interaction term between low self-control and perceptions of best friend texting while driving habits was not statistically significant, and the estimate was in a direction opposite to what our hypothesis predicted ($\beta = -0.05$, $p = .25$).

In order to better understand the nature of the conditioning effect of perceptions of other drivers' texting while driving habits on the association between low self-control and frequency of texting while driving, we used the *SSLOPE* command in STATA to estimate simple slopes, which are presented in Fig. 1. Specifically, we present the fully standardized effect of low self-control on the frequency of texting while driving at various levels (in standard deviation units) of perceptions of other drivers' texting while driving habits, net of all covariates from the prior estimated models. As Fig. 1 makes clear, the effect of low self-control on the frequency of texting while driving is highly conditional upon perceptions of other drivers' texting while driving habits. The far right side of Fig. 1 shows the effect of low self-control on the frequency of texting while driving is highly significant when perceptions of other drivers' texting while driving habits is one standard deviation above the mean ($\beta = 0.25$, $p < .001$). Conversely, the far left side of Fig. 1 shows the effect of low self-control on the frequency of texting while driving is near zero and not statistically significant when perceptions of other drivers' texting while driving habits is one standard deviation below the mean ($\beta = 0.03$, $p > .05$).

Supplementary Analyses

To assess the robustness of the above patterns, we conducted split-sample analyses. This involved splitting the sample of participants into groups according to the values for perceptions of other drivers' texting while driving habits and perceptions of best friend texting while driving habits. For each of the two moderators, we split the sample into two groups such that the first group comprises study participants who scored below the mean on the moderator, while the second group comprises study participants who scored above the mean on the moderator. Recall the mean value for the full sample for perceptions of other drivers' texting while driving habits is 7.15 (on a scale from 0 to 10) and the mean value for perceptions of best friend texting while driving is 3.30 (on a scale from 1 to 5).

The results of the split-sample analysis pertaining to perceptions of other drivers' texting while driving habits are presented in Panel A of Table 3. We present the unstandardized coefficient, standard error, and standardized coefficient for the effect of low self-control for participants scoring below the mean on perceptions of other drivers' texting while driving habits (Model 1) and for participants scoring above the mean (Model 2). For the sake of parsimony, we do not present the estimates for the remainder of the variables included in each model (they are the same covariates included in the models previously discussed). As shown, the standardized effect of low self-control on texting while driving for participants scoring below the mean on perceptions of other drivers' texting while driving habits is 0.00 ($p > .05$), while the standardized effect for low self-control for participants scoring above the mean on perceptions of other drivers' texting while driving habits is 0.27 ($p < .001$). A formal test of statistical significance across Model 1 and Model 2, based on the Paternoster, Brame, Mazerolle, & Piquero (1998) z-test for the equality of regression coefficients,

indicated that the unstandardized effect for low self-control reported in Model 1 ($b = .023$) is statistically different from the unstandardized effect reported in Model 2 ($b = 1.46$) based on a z-score of 3.19 ($p < .01$, two-tailed).

The results of the split-sample analysis pertaining to perceptions of best friend texting while driving habits are presented in Panel B of Table 3. As shown, the standardized effect of low self-control on texting while driving for participants scoring below the mean on perceptions of best friend texting while driving habits is 0.21 ($p < .001$), whereas the standardized effect for low self-control for participants scoring above the mean on perceptions of best friend texting while driving habits is 0.09 ($p > .05$). A formal test of statistical significance across Model 1 and Model 2, again based on the Paternoster et al. (1998) z-test, indicated that the unstandardized effect for low self-control reported in Model 1 ($b = 1.07$) is not statistically different from the unstandardized effect reported in Model 2 ($b = 0.50$) based on a z-score of 1.23 ($p > .05$). Overall, the results of split-sample models are consistent with the results based on the models utilizing the multiplicative interaction terms.

As a final consideration, we examined the implications of modeling texting while driving as a dichotomous variable given that prior work (i.e., Gray, 2015) failed to find a statistically significant association between low self-control and a dichotomized measure of texting while driving in multivariate models. To do this, we dichotomized the measure of texting while driving such that a value of 0 was assigned to participants who reported engaging in no texting while driving in the past 30 days (10% of the sample) and a value of 1 was assigned to participants who reported engaging in any amount of texting while driving in the past 30 days (90% of the sample). As a first point of comparison, the bivariate correlation between low self-control and the dichotomized measure of texting while driving in the current data was found to be 0.09 ($p < .05$), while the bivariate correlation between low self-control and the originally-coded measure of frequency of texting while driving, as reported in Appendix Table 4, is 0.20 ($p < .001$).

As a second point of comparison, we estimated two logistic regression models, presented in Appendix Table 5, predicting the dichotomized measure of texting while driving, with low self-control and each of the covariates as predictors (Model 1), and with the interaction terms (Model 2). Briefly, these models indicated several important things. First, for the model without the interactions, low self-control was *not* a statistically significant predictor of having engaged in any amount of texting while driving ($b = 0.26$, $p = 0.11$). Second, in this model, perceptions of other drivers' texting while driving ($b = 0.39$, $p < .01$) and perceptions of best friend texting while driving ($b = 0.34$, $p < .05$) were each positively associated with texting while driving. Third, for the model with the interaction terms, the interaction between low self-control and perceptions of other drivers' texting while driving was positive and statistically significant ($b = 0.34$, $p < .05$), while the interaction between low self-control and perceptions of best friend texting while driving was near zero and did not approach statistical significance ($b = 0.08$, $p = 0.59$).

Discussion

Texting while driving is a known contributor to traffic accidents, often resulting in severe economic, social, and emotional costs to those involved. Given this, understanding the factors that contribute to texting while driving is of paramount importance if efforts to try and curb the behavior are to be realized. In this study, we sought to contribute to the literature examining the causes of texting while driving by testing a model that integrates self-control (Gottfredson & Hirschi, 1990) and social learning (Akers, 2009) concepts. In this final section, we discuss our findings and their implications for theory and practice, the limitations of the study that point to directions for future research, and provide concluding remarks.

The first main finding of this study is that low self-control is associated with a greater frequency of texting while driving. This was found in both bivariate and multivariate models, with a standardized effect of 0.15 found in a model controlling for demographic variables and several social learning variables. This finding is consistent with what was recently reported by Quisenberry (2015) and other studies outside of criminology (e.g., Billieux et al., 2008; Panek et al., 2015), yet inconsistent with what Gray (2015) and Green (2017) both reported. While the null results emerging from Green's (2017) study could be an artifact of the small sample size (115 participants), a different explanation is possible with regard to the null findings reported by Gray (2015). Specifically, as noted in our supplementary analyses, low self-control failed to emerge as a statistically significant predictor of a dichotomized measure of texting while driving in the model which excluded the interaction terms, which is precisely what Gray (2015) found as well. Thus, low self-control may be a stronger predictor of the *frequency* but not the *prevalence* of texting while driving.

The second main finding of this study is that perceptions of the driving behavior of others significantly moderate the effect of low self-control on texting while driving. At lower values for perceptions, low self-control was not associated with texting while driving (see Fig. 1), whereas at higher values the effect of low self-control was highly significant and substantively important; this general pattern was also replicated in the logistic regression model. Thus, it would appear that the influence that one's level of self-control has on texting while driving is strongly conditioned by the perceived behavior of other drivers on the road.

The third main finding of this study is that perceptions of best friend texting while driving do not moderate the effect of low self-control on texting while driving. This finding is contrary to with some studies examining the interactive effect between low self-control and peer behavior have found (Gibson & Wright, 2001; Hirtenlehner et al., 2015; Wright et al., 2001), while at the same time consistent with other studies that found no evidence of moderation (McGloin & Shermer, 2009; Yarbrough et al., 2012). Despite the lack of evidence of moderation, it should be noted that perceptions of best friend texting while driving emerged as a statistically significant predictor of texting while driving, as did views regarding the wrongfulness of texting while driving. These findings are in line with prior research assessing social learning theory (Pratt et al., 2010).

The findings of this study have important implications for both theory and practice. With regard to theory, the findings provide additional support for both self-control theory and social learning theory, as variables reflecting constructs from both theories were associated with texting while driving in multivariate models. The findings also offer additional evidence reinforcing the complementary nature of the two theories, as indicated by the highly conditioned effect of low self-control on texting while driving depending on one's perceptions of the proportion of other drivers who engage in texting while driving. From a policy and practice standpoint, the findings of this study reinforce the importance of efforts to reduce the potential for deficits in self-control to develop during childhood and adolescence. If such deficits can be avoided, the frequency of texting while driving among young adults could also be reduced. In addition, the findings of this study suggest that efforts aimed at altering a person's perceptions concerning the texting and driving habits of others, as well their views on how wrong it is to text and drive, could also serve to reduce the frequency of the behavior. Even if such programming might not entirely reduce the frequency of texting while driving among high frequency texters to zero, even a reduction in the frequency is a direction in the right step. Thus, things like AT&T's "It Can Wait" campaign should be supported and expanded. Just as public awareness campaigns changed perceptions regarding the harms of smoking in the past, similar efforts may, over time, change perceptions about texting while driving.

Having discussed the findings of this study and their implications, certain limitations require attention. First, this study was based on a convenience sample, and even though the prevalence of texting while driving was high in the sample (90%), different results pertaining to the relationships investigated herein could be obtained from a sample that is more representative of the driving population. Second, the study was cross-sectional, which limits our ability to establish causal ordering. This being said, it is more defensible to argue that a trait like low self-control would precede recent texting while driving as opposed to arguing that texting while driving influences someone's self-control. Third, though we took steps to reduce the potential for memory recall error by limiting the reference period for texting while driving to the past 30 days and inquiring about texting on separate drives rather than individual texts sent/received, we have no way to assess the accuracy of each participant's report of texting while driving.

Fourth, regarding the perceptual measures of other drivers' and best friend's texting while driving, the possibility of projection effects does exist (e.g., Boman IV, Stogner, Miller, Griffin III, & Krohn, 2012) where a person's texting while driving could explain variability in perceptions rather than vice versa. Recognizing this, it is worth emphasizing for readers that our interest in measuring these variables had less to do with whether they influenced texting and driving and more to do with whether they conditioned the effect of low self-control. Lastly, as with much research within criminology, the study was non-experimental and we cannot rule out the potential for omitted variable bias. For example, parental self-control could influence both young adult self-control and patterns of texting while driving. Thus, future research should seek to replicate our findings when accounting for a larger set of potential confounding influences.

Despite the noted limitations, this study offers new insight into the relevance of self-control and social learning perspectives for understanding texting while driving. Given the paucity of research into the causes of texting while driving within the criminological literature coupled with the importance of addressing the pervasiveness of the behavior, there appears to be ample room for additional research. Such research can continue to investigate the relevance of self-control and social learning concepts for understanding texting while driving while also incorporating concepts from other theories. In doing so, research findings can be used to shape policies that could potentially reduce texting while driving and its detrimental effects on the lives of so many people.

Appendix 1

Table 4

Correlation matrix ($N = 469$)

Variable	1	2	3	4	5	6	7	8	9	10
1 TWD										
2 Low Self-Control	.20 ***									
3 Perception of Other Drivers' TWD Habits	.19 ***	.04								
4 Perception of Best Friend TWD Habits	.27 ***	.08	.15 **							
5 Wrongfulness of TWD	-.23 ***	-.02	.00	.04						
6 Age	-.13 **	-.05	-.00	-.09	.08					
7 Male	.08	.12 **	-.07	-.02	-.05	.02				
8 White, Hispanic	-.05	-.03	.04	.09	.12 **	.02	-.09			
9 White, non-Hispanic	.05	.02	-.07	-.03	-.01	.05	.01	-.44 ***		
10 African American	-.00	-.02	.05	-.03	-.13 **	-.08	.09	-.55 ***	-.19 ***	
11 Other Race	.03	.05	-.06	-.07	-.01	.02	.02	-.41 ***	-.14 **	-.17 ***

* $p < .05$,

** $p < .01$;

*** $p < .001$ (two-tailed); TWD Texting While Driving

Appendix 2

Table 5

Logistic regressions of dichotomized texting while driving ($N = 469$)

	Model 1		Model 2	
Predictors	b	SE	b	SE
Low Self-Control ^a	.26	.16	.38 *	.18

	Model 1		Model 2	
Perception of Other Drivers' TWD Habits ^a	.39 ^{**}	.15	.44 ^{**}	.15
Perception of Best Friend TWD Habits ^a	.34 [*]	.16	.39 [*]	.17
Wrongfulness of TWD	-.37	.21	-.40	.22
Age	-.04	.03	-.04	.03
Male	.38	.33	.37	.33
White, non-Hispanic	-.70	.45	-.71	.46
African American	-.57	.45	-.60	.45
Other Race	-.95 [*]	.46	-.96 [*]	.46
LSC × Perception of Other Drivers' TWD Habits			.34 [*]	.16
LSC × Perception of Best Friend TWD Habits			.08	.14
Nagelkerke R ²	.13		.15	

TWD Texting while driving; SE standard error

*
p < .05;

**
p < .01;

p < .001 (two-tailed)

^a standardized prior to estimation of the models

Biography

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Fig. 1.

Effect of low self-control on TWD across levels of perceptions of other drivers' TWD with 95% confidence intervals. ** $p < .01$, *** $p < .001$, (two-tailed)

Table 1Descriptive Statistics ($N = 469$)

Variable	Mean/%	SD	Min	Max
Dependent Variable				
TWD Past 30 Days	3.68	2.86	0	9
Never	10%	–	–	–
1–5 Drives	18%	–	–	–
6–10 Drives	14%	–	–	–
11–15 Drives	13%	–	–	–
16–20 Drives	12%	–	–	–
21–25 Drives	6%	–	–	–
26–30 Drives	6%	–	–	–
31–35 Drives	6%	–	–	–
36–40 Drives	3%	–	–	–
41+ Drives	12%	–	–	–
Independent Variables				
Low Self-Control	2.28	0.53	1	3.67
Perception of Other Drivers' TWD Habits	7.15	1.90	1	10
Perception of Best Friend TWD Habits	3.30	1.01	1	5
Wrongfulness of TWD	3.27	0.82	1	4
Age	23.95	4.59	18	49
Male (= 1)	50%	–	–	–
White and Hispanic (Reference Group)	57%	–	–	–
White and non-Hispanic	13%	–	–	–
African American	19%	–	–	–
Other Race	11%	–	–	–

TWD Texting While Driving

Table 2

OLS regressions of frequency of texting while driving (N = 469)

	Model 1			Model 2			Model 3			Model 4		
Predictors	b	SE	β	b	SE	β	b	SE	β	b	SE	β
Low Self-Control ^a	.56***	.13	.19	.51***	.13	.18	.42**	.12	.15	.40**	.12	.14
Perception of Other Drivers TWD Habits ^a							.44***	.12	.15	.43***	.12	.15
Perception of Best Friend TWD Habits ^a							.71***	.12	.25	.70***	.12	.25
Wrongfulness of TWD							-.79***	.15	-.23	-.78***	.15	-.22
Age				-.08**	.03	-.12	-.06*	.03	-.09	-.05*	.03	-.09
Male				.31	.26	.05	.36	.24	.06	.40	.24	.07
White and non-Hispanic				.47	.40	.06	.59	.37	.07	.56	.37	.07
African American				.04	.34	.01	-.13	.32	-.02	-.12	.32	-.02
Other Race				.30	.42	.03	.50	.39	.06	.54	.39	.06
LSC $\times$ Perception of Other Drivers' TWD Habits										.33**	.12	.11
LSC $\times$ Perception of Best Friend TWD Habits										-.12	.10	-.05
Adjusted R ²	.04			.05			.18			.19		

TWD Texting while driving; b unstandardized coefficient, SE standard error, β standardized coefficient* $p < .05$;** $p < .01$;*** $p < .001$ (two-tailed)^a standardized prior to estimation of the models

Split-sample OLS estimates for effect of low self-control on TWD below versus above the mean on perceptions of other drivers' and best friend TWD habits

Table 3

Panel A: Other Drivers	Model 1 (<i>N</i> = 239)			Model 2 (<i>N</i> = 230)		
	Below mean for perception of other drivers' TWD habits			Above mean for perception of other drivers' TWD habits		
	<i>b</i>	<i>SE</i>	β	<i>b</i>	<i>SE</i>	β
Low Self-Control	.023	.313	.00	1.46***	.328	.27
Paternoster et al. (1998) Z Test for Equality of Effect of Low Self-Control Across Model 1 and Model 2: $z = 3.19^{**}$						
Panel B: Best Friend	Model 1 (<i>N</i> = 261)			Model 2 (<i>N</i> = 208)		
	Below mean for perception of best friend TWD habits			Above mean for perception of best friend TWD habits		
	<i>b</i>	<i>SE</i>	β	<i>b</i>	<i>SE</i>	β
Low Self-Control	1.07***	.304	.21	0.50	.350	.09
Paternoster et al. (1998) Z Test for Equality of Effect of Low Self-Control Across Model 1 and Model 2: $z = 1.23$						

b unstandardized coefficient, *SE* standard error, β standardized coefficient

**
 $p < .01$,

 $p < .001$ (two-tailed)

TWD texting while driving