The Journal of Psychology, 2015, *149*(7), 665–683

doi: 10.1080/00223980.2014.964166

Cell Phone-Related Near Accidents Among Young Drivers: Associations With Mindfulness

CHRISTOPHER P. TERRY
Elmira College

DANIELLE L. TERRY
Clinical Practice

ABSTRACT. Cell phone use while driving (CPWD) has been shown to significantly reduce driver safety. This is a particular concern among young drivers who possess less driving experience and tend to engage in high rates of cell phone use. The present study identified psychological predictors of near accidents related to CPWD among a sample of 385 college student drivers. Participants answered a series of questions regarding their use of a cell phone while driving and completed measures of mindfulness, polychronicity, and intrusive thinking. Students who reported talking on their phone or texting more frequently while driving reported a higher incidence of near accidents related to each behavior. However, after controlling for CPWD, multiple regression analysis indicated that those who reported experiencing more cell phone-related intrusive thoughts also experienced more near accidents. Furthermore, two facets of mindfulness—*acting with awareness* and *nonjudging of inner experience*—were negatively associated with near accidents. These findings suggest that individuals who are more aware of the present moment and accepting of their affective responses may better regulate their attention while using a cell phone behind the wheel.

Keywords: cell phones, college students, driving, mindfulness, text messaging

DISTRACTED DRIVING HAS BECOME A MAJOR PUBLIC HEALTH CONCERN, with cell phone use while driving (CPWD) identified as one of the most common forms of distracted behavior behind the wheel (Braitman & McCartt, 2010). The National Safety Council recently estimated that 21% of all motor vehicle crashes involve cell phone conversations and an additional 4% involve texting while driving (NSC, 2013). Research using both driving simulators and closed test tracks has confirmed that CPWD, whether to talk or text, significantly increases one's risk of experiencing an accident (e.g., Drews, Yazdani, Godfrey,

Address correspondence to Christopher P. Terry, Department of Psychology, Elmira College, One Park Place, Elmira, NY 14901, USA; cterry@elmira.edu (e-mail).

Cooper, & Strayer, 2009; Hancock, Lesch, & Simmons, 2003; Strayer, Drews, & Crouch, 2006). Furthermore, drivers may not be aware of the extent to which CPWD disrupts their driving performance (Horrey, Lesch, & Garabet, 2008; Lesch & Hancock, 2004).

Young drivers have been identified as an at-risk group for distracted driving. The National Highway Traffic Safety Administration (NHTSA) reported that drivers younger than 20 represent the age group with the highest proportion of distraction-related traffic fatalities (NHTSA, 2010). College students' frequency of talking on the phone while driving is also a significant predictor of accidents and near-accidents (Seo & Torabi, 2004). Although young drivers tend to acknowledge significant risks associated with CPWD (Atchley, Atwood, & Boulton, 2011; Nelson, Atchley, & Little, 2009), research suggests that young drivers still engage in high levels of CPWD and that prevention efforts have been largely ineffective over the long-term (Cazzulino, Burke, Muller, Arbogast, & Upperman, 2014).

Some research has focused on identifying individual differences related to one's propensity for engaging in CPWD. For instance, young drivers who perceive high illusory control, including overestimating their driving proficiency and viewing themselves as being effective at compensating for cell phone-related interference, report more frequent CPWD in everyday life (Schlehofer et al., 2010). Young drivers who hold strong beliefs about the disadvantages associated with abstaining from accessing one's phone while driving also engage in more frequent CPWD (Hafetz, Jacobsohn, Garcia-Espana, Curry, & Winston, 2010). Furthermore, a recent study among a nationally representative sample of young drivers found that attachment to one's cell phone predicted CPWD, even after controlling for overall cell phone use and perceived risk (Weller, Shackleford, Dieckmann, & Slovic, 2013). In fact, perceived risk alone has generally been found to be a weak predictor of CPWD (Atchley et al., 2011), with research suggesting that perceived social norms may have a greater influence on one's intentions to engage in CPWD, including texting (Nemme & White, 2010). A recent review of the research on psychosocial predictors of CPWD found that perceived controllability, perceived social norms, call importance, and lack of effective law enforcement all uniquely predict CPWD and may help account for the discrepancy between perceived risk and one's propensity for engaging in CPWD (Cazzulino et al., 2014).

The construct of mindfulness—often described as the ability to focus one's attention on the present moment in a nonjudgmental way (Brown & Ryan, 2003)—has also been linked to CPWD. In a study among college student drivers, Feldman, Greeson, Renna, and Robbins-Monteith (2011) found that participants who scored lower on a trait-level measure of mindfulness reported texting more often while driving. In this study, attention-regulation motives (i.e., *avoiding* texting in order to focus on the moment) were negatively associated with texting rates while driving, whereas emotion-regulation motives (i.e., *engaging* in texting to reduce negative emotions) were positively associated with texting rates and appeared to partially mediate the association between trait mindfulness and texting

while driving. These results suggest that young drivers who are less motivated to focus on the present moment and rely on texting as an emotion-regulation strategy may be more at risk when able to access their phone while driving. By contrast, more mindful individuals, especially those with alternative emotion-regulation strategies, may be better suited to resist the temptation to text while driving.

Although preliminary connections between mindfulness and distracted driving behavior have only been recently demonstrated, a large body of empirical research, including laboratory experiments, correlational studies, and controlled comparisons of clinical interventions, has firmly established associations between mindfulness and a variety of positive outcomes (Keng, Smoski, & Robins, 2011). In particular, mindfulness has been associated with increases in subjective well-being, attenuation of psychological symptoms, management of physical pain, reductions in negative emotional reactivity, and improvements in behavioral regulation (Brown, Ryan, & Creswell, 2007). Mindfulness-based interventions have also been widely employed in different types of clinical settings (Baer, 2003), largely stemming from the popularization of Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn, 1990).

While ongoing empirical and theoretical work continues to shape still-evolving definitions of mindfulness (Brown & Ryan, 2004), research focusing on individual differences in mindfulness at the trait level indicates that it may be best conceptualized as a multidimensional construct (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). In this regard, some authors have argued that mindfulness involves two critical components: (a) present moment awareness, which involves bringing awareness to current experience by regulating the focus of attention, and (b) nonjudgmental acceptance, which involves accepting current thoughts, feelings, and sensations by maintaining an open orientation of curiosity (Bishop, Lau, Shapiro, Carlson, & Anderson, 2004). These distinct yet interrelated facets of mindfulness have been labeled *awareness* and *acceptance,* respectively (Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008). In this sense, it has been argued that mindfulness does not necessarily reduce immediate affective reactions, but together, awareness and acceptance of those reactions may lessen their long-term negative consequences, leading to reduced rumination and more adaptive processing of emotional states (Williams, 2010).

Some recent research investigating the mechanisms underlying the link between mindfulness and emotion-regulation has implicated the activation, and possible enhancement, of executive control, suggesting that increased awareness and acceptance of affective cues prompts the activation of executive control mechanisms that regulate the allocation of attention (Teper, Segal, & Inzlicht, 2013). Such findings add to a growing body of research supporting the notion that mindfulness training can lead to improvements in certain aspects of cognitive performance, including the regulation of attention and the operation of working memory (Chiesa, Calati, & Serretti, 2011). In addition, participation in an MBSR training protocol

can improve various aspects of attentional control, including attention orienting and conflict monitoring (Jha, Krompinger, & Baime, 2007).

Other forms of mindfulness training, such as mindfulness meditation practices (MMP), may enhance cognitive flexibility (Moore & Malinowski, 2009), improve performance on certain measures of working memory and sustained attention (Chambers, Lo, & Allen, 2007), and increase one's ability to inhibit prepotent responses (Teper & Inzlicht, 2013). Among individuals who regularly engage in activities such MMP, participation in additional mindfulness training exercises may enhance awareness of the present moment in non-directed tasks (e.g., unfocused sustained attention) without necessarily affecting attentional control mechanisms (Anderson, Lau, Segal, & Bishop, 2007). Although these findings suggest a strong link between mindfulness training and attention regulation, there is still a clear need for further research in order to firmly establish the nature, extent, and reliability of potential cognitive benefits associated with mindfulness (Chiesa et al., 2011).

Furthermore, research linking mindfulness to performance in real-world settings that demand attentional control is lacking. Within the field of research studying CPWD, there has been a large emphasis on identifying psychosocial factors that predict CPWD, with less work emphasizing individual differences related to one's penchant for experiencing negative consequences when engaging in CPWD. Influenced by these relatively disparate areas of research, the major aim of the present study was to identify psychological predictors of near accidents related to CPWD among young drivers. We focused on several unique factors that might help explain accident risk among college student drivers, including one's general preference for multitasking, the experience of intrusive thoughts related to one's cell phone, and scores on several facets of a multidimensional trait-level measure of mindfulness. It was hypothesized that, after controlling for one's frequency of CPWD and one's preference for multitasking, the experience of intrusive thoughts related to one's phone would be associated with experiencing more near accidents. However, it was hypothesized that those scoring higher on certain aspects of mindfulness—in particular, those related to *awareness* and *acceptance*—would report a lower incidence of near accidents.

Method

Participants

Participants included 385 college students selected from a larger sample of 470 students who completed an online survey about cell phone use and multitasking behaviors. Participants were excluded from analyses if they reported they did not own a cell phone or have a driver's license. Of the original sample, 99.8% of participants owned a cell phone and 82.1% had a driver's license. Among the reduced sample (M_{age} = 19.0, SD = 1.2), 52% were male and 67% were first-year college students; 22% were sophomores; 8% were juniors; and 4%

were seniors. Seventy-one percent were Caucasian, 9% were African American, 8% were Asian American, 6% were Latino/a or Hispanic, and 5% indicated another race or ethnicity. Based on the age at which participants reported obtaining their driver's license, participants had less than three years of driving experience ($M = 2.79$, $SD = 1.27$, $Min = .5$, $Max = 10$).

Procedure

All participants were recruited from the introductory psychology subject pool at a large Northeastern university during the second semester of the academic year. The study involved completing an IRB-approved online survey that asked various questions about multitasking preferences and behaviors, including the use of a cell phone while engaged in other tasks. The survey took approximately 30 minutes to complete and all participants received extra credit for their participation in the study. The survey was divided into several sections and participants were prompted to complete any omitted answers before moving to the next section.

Materials

Cell Phone Use While Driving (CPWD)

Participants answered a series of six questions about their experience using a cell phone while driving. Participants reported their frequency of CPWD using a 5-point Likert-type scale ranging from 0 (*never*) to 4 (*very often*), and provided separate ratings for talking on a cell phone versus reading/sending text messages. Specifically, participants were asked: "*When you're driving, how often do you* [*talk on a cell phone* or *read or send text messages*]?" Using the same scale, participants also reported how often they have experienced near accidents related to their use of a cell phone while driving, again providing separate estimates for talking on the phone versus texting. Near accidents were described as experiencing a "close call" that almost resulted in a traffic accident. Specifically, participants were asked: "*When you're* [*talking on your cell phone* or *texting*] *while driving, how often have you experienced a 'close call' where you've almost been in a traffic accident?*" Participants indicated whether they had ever experienced an actual traffic accident when using a cell phone while driving. Participants provided separate responses for talking on the phone versus texting, indicating whether they had been involved in each type of cell phone-related traffic accident "*never*," "*once*," or "*more than once.*"

Multitasking Preference Inventory (MPI)

The MPI is a scale designed to assess the construct of *polychronicity*, defined as one's preference for multitasking (Poposki & Oswald, 2010). In the face of varying definitions throughout the literature, Poposki and Oswald sought to promote further research on polychronicity by establishing a definition that separates one's report of the frequency with which one engages in multitasking from one's

personal preference. The MPI therefore assesses polychronicity at the trait level by focusing exclusively on one's preferences for approaching tasks in a monochronic versus polychronic manner, including such statements as "*I am much more engaged in what I am doing if I am able to switch between several different tasks*" and "*When I have a task to complete, I like to break it up by switching to other tasks intermittently.*" The MPI includes 14 items that are rated on a 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Scores range from 14 to 70, with a higher score indicating a greater degree of polychronicity. Poposki and Oswald (2010) presented data indicating good internal consistency and test-retest reliability of the MPI as a unidimensional measure, as well as evidence supporting the content validity, criterion validity, and convergent/discriminant validity of the measure. Reliability analysis indicated good internal consistency for the MPI with the present sample ($\alpha = .90$).

Cell Phone Intrusive Thoughts Scale (CPITS)

The CPITS includes four statements designed to assess the experience of intrusive thoughts related to accessing one's cell phone, such as "*When I can't access my phone, I find myself thinking about whether I've missed any text messages or phone calls*" (Olmsted & Terry, 2014). All items are rated on a 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Responses demonstrated adequate internal consistency with the present sample ($\alpha = .75$). Therefore, following previous work by Olmsted and Terry (2014), responses to these four items were combined into a single measure, with scores ranging from 4 to 20. Higher scores were regarded as indicating more intrusive thoughts about one's cell phone when access to one's phone might be limited or restricted.

Five Facet Mindfulness Questionnaire (FFMQ)

The FFMQ was developed by Baer and colleagues (2006) by drawing items from five other self-report measures of mindfulness. Psychometric analysis of the combined set of items resulted in a 39-item multidimensional measure that assesses five distinct but related facets of mindfulness. Items are rated on a 5-point Likert-type scale ranging from 1 (*never or very rarely true*) to 5 (*very often or always true*), with higher scores indicating a greater degree of mindfulness within each domain. Research has supported the construct validity of the FFMQ as a multidimensional measure of mindfulness and the measure's five-factor structure has been replicated among multiple samples (Baer et al., 2008). The five subscales have been labeled (Baer et al., 2006) and further described (Baer et al., 2008) as follows: (a) *observing* (i.e., noticing or attending to internal and external experiences, such as thoughts and sensations), (b) *describing* (i.e., labeling internal experiences with words), (c) *acting with awareness* (i.e., attending to present-moment activities; avoiding behaving automatically); (d) *nonjudging of inner experience* (i.e., taking a nonevaluative stance toward thoughts and feelings), and (e) *nonreactivity*

to inner experience (i.e., allowing thoughts and feelings to come and go without getting caught up in them). Reliability analysis with the present sample indicated adequate to good internal consistency for all five subscales of the FFMQ ($\alpha = .72$–$.88$). A factor analysis using principal components extraction and Varimax rotation also supported a five-factor model for the FFMQ with the present sample. All items loaded onto the expected factor (factor loadings ranged from .43–.79) and the five factors accounted for 47% of variance in scores. Examination of a scree plot showed substantial separation between these five factors (eigen values > 2.13) and any additional factors (eigen values < 1.25). The subscales showed generally weak, but positive associations (average $r = .14$). Intercorrelations of the five subscales are reported in Table 1.

Plan of Analysis

All summary statistics and inferential tests were conducted using IBM SPSS Version 20. Normality was determined by visual inspection of histograms and examination of skewness and kurtosis measures. Means were compared using paired-samples t tests. Statistical associations were examined using Pearson's product-moment correlation coefficient and simultaneous multiple regression. The type I error rate was set at .05 for all analyses.

Results

Cell Phone Use While Driving (CPWD)

Of the 385 licensed drivers included in the sample, all of whom owned a cell phone, 91% reported engaging in CPWD, 63% reported experiencing one or more near accidents related to CPWD, and 3.4% reported experiencing one or more actual traffic accidents related to CPWD. When broken down by type of cell phone use, 84% of participants reported talking on their phone while driving and 82% reported texting while driving. Half of the participants reported having experienced one or more near accidents when talking on their phone while driving (50%) and more than half reported having such experiences while texting (56%). Although few participants reported experiencing an actual traffic accident when using their phone, 1.3% admitted to being involved in an accident while talking on their cell phone ($n = 5$) and 2.6% admitted to being involved in an accident while texting ($n = 10$).

Participants also reported the frequency with which they use their phone for talking versus texting and the frequency with which they experience "close calls" related to each form of CPWD. Participants did not report texting while driving ($M = 1.55$, $SD = 1.04$) more often than talking on their cell phone while driving ($M = 1.46$, $SD = 0.92$), $t(384) = 1.78$, $p = .08$, $d = .09$. However, they reported experiencing near accidents more frequently when texting while driving ($M = 0.88$, $SD = 0.95$) than when talking on their cell phone ($M = 0.69$, $SD = 0.83$), $t(384) = 5.03$, $p < .001$, $d = .21$ (see Figure 1).

TABLE 1. Correlations Among Study Variables

Measure	1	2	3	4	5	6	7	8	9	10	11	12
1. Near Accidents (Talking)	—											
2. Near Accidents (Texting)	.65**	—										
3. Talking while Driving	.44**	.38**	—									
4. Texting while Driving	.44**	.44**	.52**	—								
5. Years Driving	.12*	.08	.21**	.13**	—							
6. Polychronicity (MPI)	.02	.03	.04	.11*	.01	—						
7. Cell Thoughts (CPITS)	.26**	.27**	.12*	.27**	.02	−.02	—					
8. Observing (FFMQ)	.00	−.01	−.02	−.07	.04	−.08	−.02	—				
9. Describing (FFMQ)	−.06	−.07	.04	−.03	.06	.02	.01	.21**	—			
10. Awareness (FFMQ)	−.21**	−.26**	−.05	−.12*	−.03	−.08	−.16**	−.10	.29**	—		
11. Nonjudging (FFMQ)	−.23**	−.22**	−.07	−.11*	−.03	−.03	−.12*	−.17**	.22**	.37**	—	
12. Nonreactivity (FFMQ)	−.13*	−.15**	−.03	−.13*	.10	−.02	−.22**	.18**	.19**	.11*	.06	—

Note. MPI = Multitasking Preference Inventory; CPITS = Cell Phone Intrusive Thoughts Scale; FFMQ = Five Facet Mindfulness Questionnaire.
*$p < .05$. **$p < .01$.

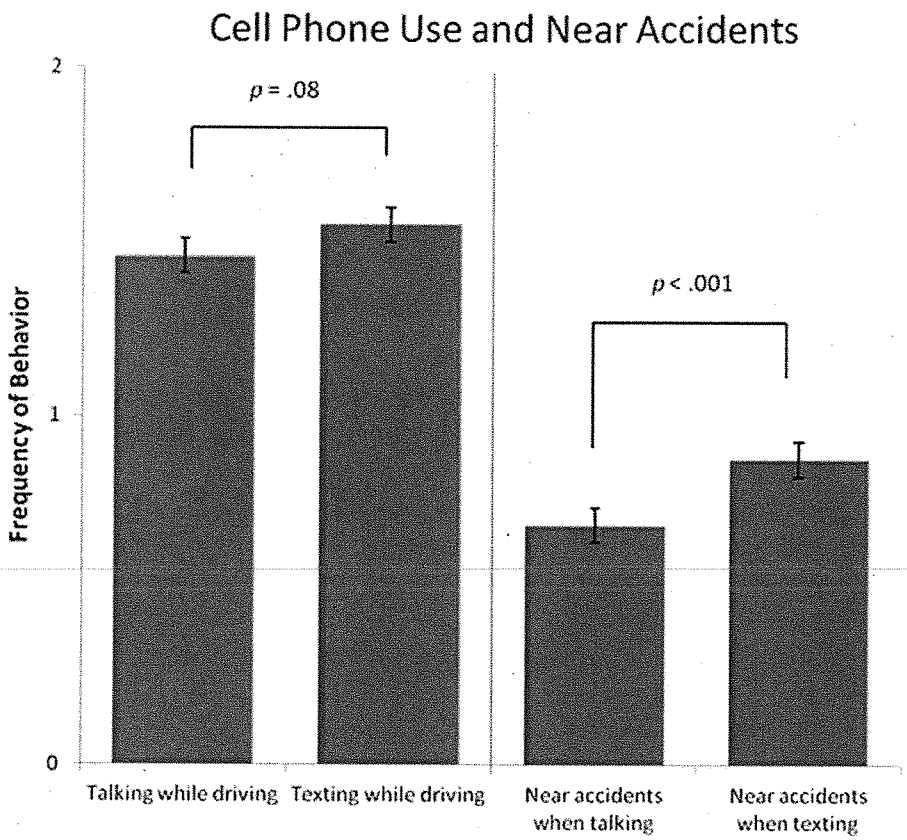

FIGURE 1. Mean frequency estimates for talking on one's cell phone while driving and texting while driving, as well as the experience of near accidents when talking or texting. All ratings were made using a 5-point Likert-type scale ranging from 0 (*never*) to 4 (*very often*). Error bars represent one standard error of the mean.

Rates of texting while driving were similar between males ($M = 1.63$, $SD = 1.10$) and females ($M = 1.46$, $SD = 0.97$), $t(383) = 1.65$, $p = .10$, $d = .17$. Although, males reported having cell phone conversations more often when driving ($M = 1.57$, $SD = 0.96$) than did females, ($M = 1.34$, $SD = 0.87$), $t(383) = 2.51$, $p = .01$, $d = .26$. However, sex differences were not apparent with regard to the frequency of near accidents related to cell phone conversations, $t(383) = 0.32$, $p = .75$, $d = .03$, or texting while driving, $t(383) = 0.54$, $p = .59$, $d = .06$.

Predicting Near Accidents

Because few traffic accidents related to CPWD were reported, but "close calls" were common, near accidents were used as a proxy for risk exposure. Despite the small number of accidents reported, near accidents and actual accidents were

correlated, $r(383) = .26$, $p < .001$. Age and years of driving experience were strongly correlated, $r(383) = .74$, $p < .001$, and so years of driving experience was used instead of age in all subsequent analyses.

Bivariate correlations were examined between near accidents (related to texting versus talking on one's phone), frequency of CPWD (separated by talking versus texting), years of driving experience, and the following measures: polychronicity (MPI), cell phone-related intrusive thoughts (CPITS), and the five facets of mindfulness measured by the FFMQ (see Table 1). As expected, texting frequency when driving predicted texting-related near accidents, $r(383) = .44$, $p < .001$, and frequency of cell phone conversations predicted near accidents related to talking on one's phone, $r(383) = .44$, $p < .001$. Near accidents related to talking on one's phone and texting while driving were strongly correlated, $r(383) = .65$, $p < .001$, as were talking and texting behaviors, such that participants who reported talking on their phone more often when driving were also more likely to text behind the wheel, $r(383) = .52$, $p < .001$. Participants with more driving experience were more likely both to talk on their phone while driving, $r(383) = .21$, $p < .001$, and text while driving, $r(383) = .13$, $p < .01$.

Polychronicity, or one's preference for multitasking (as measured by the MPI), was only correlated with one other variable: texting while driving, $r(383) = .11$, $p < .05$. However, one's frequency of experiencing cell phone-related intrusive thoughts (as measured by the CPITS) was positively correlated both with talking and texting behaviors ($r = .12$ and .27), as well as talking and texting-related near accidents ($r = .26$ and .27). Near accidents related to talking and texting were also negatively correlated with three facets of mindfulness: acting with awareness ($r = -.21$ and $-.26$), nonjudging of inner experience ($r = -.23$ and $-.22$), and nonreactivity to inner experience ($r = -.13$ and $-.15$).

Multiple regression was used to identify factors that accounted for unique variance in predicting one's frequency of experiencing near accidents related to CPWD. Each of the previously listed variables was entered into two simultaneous multiple regression models, one predicting near accidents related to talking on one's phone and one predicting near accidents related to texting. All variables were normally distributed, with the exception of years of driving experience, which was positively skewed. This was corrected by performing a natural log transformation on this variable before entering it into the regression models. However, outcomes were comparable when both models were run with and without the log-transformed version of this variable.

Near accidents related to cell phone conversations was regressed on the following variables: frequency of talking on one's cell phone while driving, years of driving experience (log-transformed), polychronicity (MPI), cell phone-related intrusive thoughts (CPITS), and the five facets of mindfulness measured by the FFMQ. The analysis produced a significant model that accounted for approximately 28% of the variance in near accidents, $R^2 = .28$, $R^2_{adj} = .27$,

TABLE 2. Multiple Regression Analysis Predicting Near Accidents Related to Talking

Variable	*B*	*SE(B)*	*β*	*t*	*p*
Talking while Driving**	**.36**	**.04**	**.40**	**8.69**	**.00**
Years Driving (log)	.02	.08	.01	0.27	.79
Polychronicity (MPI)	−.00	.00	−.01	−0.14	.89
Cell Thoughts (CPITS)**	**.04**	**.01**	**.17**	**3.67**	**.00**
Mindfulness (FFMQ subscales)					
Observing	−.00	.01	−.02	−0.35	.73
Describing	.00	.01	.00	0.03	.98
Acting with Awareness*	**−.02**	**.01**	**−.10**	**−2.06**	**.04**
Nonjudging*	**−.02**	**.01**	**−.15**	**−3.00**	**.00**
Nonreactivity	−.01	.01	−.06	−1.25	.21

Note. The regression model was significant, $R^2 = .28$, $R^2_{adj} = .27$, $F(9, 375) = 16.35$, $p < .001$. All variables in bold contributed significantly to the model.
MPI = Multitasking Preference Inventory; CPITS = Cell Phone Intrusive Thoughts Scale; FFMQ = Five Facet Mindfulness Questionnaire. Years Driving was log-transformed to meet the assumption of normality. The five subscales of the FFMQ are listed in italics.
$^{**}p < .01$. $^{*}p < .05$.

$F(9, 375) = 16.35, p < .001$ (see Table 2). Four variables contributed significantly to the regression model. One's frequency of talking on the phone while driving was the strongest predictor of near accidents, $\beta = .40$, $t = 8.69$, $p < .001$. However, three psychological variables also contributed significantly to the model. Although one's general preference for multitasking did not predict near accidents, $\beta = -.01$, $t = -0.14$, $p = .89$, one's experience of cell phone-related intrusive thoughts did, $\beta = .17$, $t = 3.66$, $p < .001$. Furthermore, two facets of mindfulness were negatively associated with near accidents. Those who scored lower on the acting with awareness, $\beta = -.10$, $t = -2.06$, $p < .05$, and nonjudging of inner experience, $\beta = -.15$, $t = -3.00$, $p < .01$, dimensions of the FFMQ had a higher incidence of near accidents when conversing on the phone, even after controlling for frequency of cell phone conversations while driving.

This procedure was repeated for near accidents related to texting, with texting frequency replacing talking frequency as one of the predictor variables. This analysis also produced a significant regression model that accounted for approximately 28% of the variance in texting-related near accidents, $R^2 = .28$, $R^2_{adj} = .26$, $F(9, 375) = 15.79$, $p < .001$ (see Table 3). Texting frequency accounted for the largest amount of variance in predicting texting-related near accidents, $\beta = .37$, $t = 7.80$, $p < .001$. As in the previous model, having cell phone-related intrusive thoughts was associated with experiencing more near accidents, $\beta = .12$, $t = 2.51$,

TABLE 3. Multiple Regression Analysis Predicting Near Accidents Related to Texting

Variable	*B*	*SE(B)*	*β*	*t*	*p*
Texting while Driving**	**.33**	**.04**	**.37**	**7.80**	**.00**
Years Driving (log)	.09	.09	.05	1.01	.32
Polychronicity (MPI)	−.00	.01	−.03	−0.65	.52
Cell Thoughts (CPITS)*	**.03**	**.01**	**.12**	**2.51**	**.01**
Mindfulness (FFMQ subscales)					
Observing	−.00	.01	−.01	−0.28	.78
Describing	.01	.01	.03	0.61	.54
Acting with Awareness*	**−.03**	**.01**	**−.16**	**−3.24**	**.00**
Nonjudging*	**−.02**	**.01**	**−.11**	**−2.30**	**.02**
Nonreactivity	−.01	.01	−.06	−1.28	.20

Note. The regression model was significant, $R^2 = .28$, $R^2_{adj} = .26$, $F(9, 375) = 15.79$, $p < .001$. All variables in bold contributed significantly to the model.
MPI = Multitasking Preference Inventory; CPITS = Cell Phone Intrusive Thoughts Scale; FFMQ = Five Facet Mindfulness Questionnaire. Years Driving was log-transformed to meet the assumption of normality. The five subscales of the FFMQ are listed in italics.
**$p < .01$. *$p < .05$.

$p < .05$, but polychronicity and years of driving experience were not. The observing, describing, and nonreactivity to inner experience dimensions of mindfulness were not related to near accidents. However, acting with awareness, $\beta = -.16$, $t = -3.24$, $p < .01$, and nonjudging of inner experience, $\beta = -.11$, $t = -2.30$, $p < .05$, were both negatively associated with the experience of near accidents when texting while driving.

Discussion

The present study generated several key findings that support and extend previous research on CPWD. Among a sample of college student drivers, the vast majority of participants reported engaging in CPWD, including both having cell phone conversations and texting behind the wheel. Furthermore, nearly two-thirds of participants reported experiencing near accidents related to CPWD, and the experience of near accidents was correlated with reports of actual traffic accidents involving CPWD. As expected, one's frequency of talking on the phone or texting while driving predicted one's self-reported frequency of experiencing near accidents related to each behavior, and participants reported experiencing more near accidents when texting while driving than when talking on the phone while driving.

However, when frequency of CPWD was controlled for, several other factors accounted for unique variance in predicting one's experience of near accidents. Young drivers who experienced more intrusive thoughts related to accessing their phone also reported experiencing more near accidents related to CPWD. Furthermore, participants who scored higher on two aspects of mindfulness—acting with awareness and nonjudging of inner experience—reported experiencing fewer cell phone-related near accidents. These associations suggest that accident risk may be reduced among drivers whose interactions with their cell phone while driving, either to talk or text, are less disruptive, both cognitively and emotionally.

In particular, the reduction in accident risk experienced by more mindful individuals suggests that those who are both more *aware* and *accepting* of the increased attentional demands generated by CPWD may be more capable of managing their response to these competing demands. This interpretation is supported by recent research linking mindfulness to the activation of executive control processes, especially in situations of goal conflict (Teper & Inzlicht, 2013). In this case, an increased awareness of the present moment may be important for detecting goal conflict (e.g., the conflict generated by trying to maintain a cell phone conversation or text message exchange while attempting to drive safely). Subsequently, the nonjudgmental acceptance of one's thoughts and emotions related to this conflict may be important for regulating one's affective response and reallocating attentional resources appropriately to minimize this conflict. Such mindful attention to and acceptance of the primary sensory, perceptual, and affective cues that indicate goal conflict may directly contribute to the efficient mobilization of self-regulatory resources to minimize such goal conflict (Teper et al., 2013). The present findings support this explanation, suggesting that both awareness of the present moment, and acceptance of one's thoughts and emotions, may be independent but related factors supporting the effective allocation of attention when engaging in CPWD.

Although one other facet of mindfulness—nonreactivity to inner experience—was negatively correlated with near accidents, it did not account for unique variance in either regression model. This finding is also in line with research suggesting that the effective allocation of attentional resources may be strongly supported by the strategic management of one's thoughts and emotions, rather than one's level of immediate reactivity to internal and external cues. For example, research among experienced meditators has shown that, although they tend to make fewer errors on tasks that promote response conflict, such as the Stroop task, they are more reactive to the errors they make (Teper & Inzlicht, 2013). Teper and colleagues (2013) have interpreted this finding as suggesting that more mindful individuals "who are able to accept the 'pang' of making an error may experience this quick affective state more keenly and may thus be more likely to attend to their errors and prevent them from happening on future trials" (p. 451). To this regard, the nonjudgmental acceptance of affective cues may promote more adaptive responses, such as emotion regulation, and reduce the likelihood of engaging in less adaptive responses, such as rumination or emotional

suppression. However, attending and reacting to these cues may be an important catalyst for initiating these adaptive responses.

To the best of the authors' knowledge, this is the first study to examine the association between mindfulness and the experience of cell phone-related near accidents. However, the present findings extend previous research establishing a link between mindfulness and CPWD. Feldman and colleagues (2011) found that one's decision to text while driving was influenced both by attention-regulation and emotion-regulation motives. They found that young drivers who were more aware of a need to regulate their attention were less likely to text while driving, but that many drivers actually engaged in texting while driving in order to regulate their emotions. The present findings suggest that young drivers who choose to engage in CPWD, either to talk or text, may be less likely to experience negative consequences if their use of a cell phone is not directly tied to emotion-regulation motives. Notably, the fact that scores on the nonjudging of inner experience facet of the FFMQ were negatively associated with near accidents, even after controlling for CPWD and cell phone-related intrusive thoughts, suggests that these individuals may be better at taking a nonevaluative stance toward their thoughts and feelings and, therefore, less reliant on cell phone use as an emotion-regulation strategy.

By comparison, several other factors examined in the present study were not associated with the experience of cell phone-related near accidents, including one's level of polychronicity, which was only weakly correlated with one other measure: one's frequency of texting while driving. This suggests that one's general preference for multitasking may have little to do with predicting one's likelihood of engaging in specific task combinations like CPWD or one's ability to do so effectively. Although, research on individual differences in media multitasking might help explain the lack of association between polychronicity and near accidents. Research comparing "heavy" and "light" media multitaskers has shown that although heavy media multitaskers may report a pattern of regular multitasking that indicates a strong preference for using multiple technologies simultaneously, these individuals do not necessarily demonstrate better performance in settings that demand task switching, and may actually experience more interference from irrelevant distracters (Ophir, Nass, & Wagner, 2009). Although polychronicity has been associated with enjoyment of and engagement in multitasking (Poposki & Oswald, 2010), evidence is lacking to indicate that individuals who are more polychronic actually perform better in multitasking environments (Konig & Waller, 2010).

Furthermore, two facets of mindfulness—observing and describing—were also unrelated to CPWD and the experience of cell phone-related near accidents. These two aspects of mindfulness emphasize one's attention to internal and external stimuli, especially those of a sensory nature (observing), and one's tendency to label internal experiences with words (describing). In particular, these facets emphasize a form of mindful attention that may be implemented during various

types of mindfulness training, such as a mindful eating exercise during which individuals are encouraged to carefully attend to all sensations and then describe their reactions to those sensations. In this case, the ability to engage these forms of mindful attention may be unrelated to performance in a situation like CPWD that does not emphasize a narrow focus on specific streams of information (e.g., selective attention), but demands a broader awareness of the present moment and the application of one's attention to various relevant cues (e.g., divided attention). Altogether, these results suggest that two specific aspects of mindfulness—one's level of *awareness* of all ongoing, present-moment activities, and one's ability to respond to these activities, and the emotional reactions they prompt, in a manner of open *acceptance*—may be critical elements for reducing the likelihood that one's engagement in CPWD will be disruptive to driver safety.

Of course, the most effective way to reduce the risk of experiencing an automobile accident is to refrain from CPWD altogether. Research has decidedly shown that using a cell phone to talk or text causes measurable declines in driving proficiency and significantly increases accident risk (e.g., Drews et al., 2009; Hancock et al., 2003; Strayer et al., 2006). This is a particular concern among adolescents and young adults with fewer years of driving experience who nonetheless report high rates of CPWD (Cazzulino et al., 2014). Although many states have taken measures to reduce rates of CPWD—primarily by instituting texting bans, hands-free cell phone requirements, and broader distracted driving laws—most forms of CPWD are still legal and it appears unlikely that blanket restrictions would be imposed on hands-free phone conversations. Therefore, two-fold interventions, which both inform drivers of the risks associated with CPWD and expose them to strategies for reducing their CPWD behaviors, may be necessary in order to have a broader impact on driver safety. However, results from the present study suggest that mindfulness training could serve as a third element that might prove effective for minimizing the risks associated with CPWD, especially among motorists who may be less aware of the attentional demands of safe driving or who engage in CPWD in order to regulate their emotions (Feldman et al., 2011).

Limitations

Although the sample was equally representative of male and female college students, first-year college students comprised two-thirds of the sample, an artifact of recruiting participants from an introductory psychology subject pool. Furthermore, the sample was comprised mostly of Caucasian students and relatively inexperienced drivers (participants reported less than three years of driving experience on average). Future studies would benefit from expanding on the present research with more diverse samples of young drivers, including those not enrolled in college. Second, the findings reported in the present study are based entirely on participants' self-reported behaviors, including their estimates of the frequency with which they

engage in CPWD, and their experience of real and near traffic accidents. The associations demonstrated in the present study with regard to young drivers' reports of near accidents should be further investigated using other methodologies. Studies of CPWD on closed test tracks or in driving simulators could demonstrate whether clear performance differences emerge between individuals higher or lower in trait mindfulness. Studies using self-report may benefit from incorporating diary methods for reporting one's experience of near accidents over time, as well as inquiring about the nature and extent of individuals' CPWD behaviors.

Conclusion

The present study adds important self-report data to support the finding that CPWD increases one's risk of experiencing a traffic accident, which has been well established from studies of actual driving performance. However, findings from the present study suggest that other unique factors may also contribute to one's risk of experiencing a real-life traffic accident when engaging in CPWD, even after controlling for one's frequency of CPWD. In particular, those who are less mindful about their use of a cell phone and more distracted by their interaction with the device may be at greater risk of experiencing an accident, independent of their frequency of use. This was reflected by reports of more frequent near accidents related to CPWD among young drivers who scored lower on two aspects of mindfulness: acting with awareness and nonjudging of inner experience. By contrast, those who show more *awareness* of the immediate moment and greater *acceptance* of their affective responses may be interacting with their cell phone in a manner that reduces their likelihood of experiencing an accident. Future research should further explore the association between mindfulness and reduced accident risk with particular attention to young drivers' use of internal and external strategies for regulating attention in the face of goal conflict.

AUTHOR NOTES

Christopher P. Terry is an assistant professor of psychology at Elmira College. His current research interests include multitasking, cell phone use while driving, mindfulness, and health behaviors. **Danielle L. Terry** is a clinical psychologist currently practicing in Bath, New York. Her current clinical interests include health psychology, end-of-life issues, and bereavement. Dr. Terry's published research has encompassed the areas of alcohol and tobacco use, and media use and multitasking.

REFERENCES

Anderson, N. D., Lau, M. A., Segal, Z. V., & Bishop, S. R. (2007). Mindfulness-based stress reduction and attentional control. *Clinical Psychology and Psychotherapy, 14*, 449–463. doi:10.1002/cpp.544

Atchley, P., Atwood, S., & Boulton, A. (2011). The choice to text and drive in younger drivers: How attitudes may shape behavior. *Accident Analysis and Prevention, 43*, 134–142. doi:10.1016/j.aap.2010.08.003

Baer, R. A. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice, 10*, 125–143. doi:10.1093/clipsy.bpg015

Baer, R.A., Smith, G.T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13*, 27–45. doi:10.1177/1073191105283504

Baer, R.A.., Smith, G.T., Lykins, E., Button, D., Krietemeyer, J., Sauer, S., Walsh, E., Duggan, D., & Williams, J. M. G. (2008). Construct validity of the five facet mindfulness questionnaire in meditating and nonmeditating samples. *Assessment, 15*, 329–342. doi:10.1177/1073191107313003

Bishop, S. R., Lau, M., Shapiro, S. L., Carlson, L., & Anderson, N. D. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice, 11*, 230–241. doi:10.1093/clipsy.bph077

Braitman, K. A., & McCartt, A. T. (2010). National reported patterns of driver cell phone use in the United States. *Traffic Injury Prevention, 11*, 543–548. doi:10.1080/15389588.2010.504247

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84*, 822–848. doi:10.1037/0022-3514.84.4.822

Brown, K. W., & Ryan, R. M. (2004). Perils and promise in defining and measuring mindfulness: Observations from experience. *Clinical Psychology: Science and Practice, 11*, 242–248. doi:10.1093/clipsy.bph078

Brown, K. W., Ryan, R. M., & Creswell, J. D. (2007). Mindfulness: Theoretical foundations and evidence for its salutary effects. *Psychological Inquiry, 18*, 211–237. doi:10.1080/10478400701598298

Cardaciotto, L., Herbert, J. D., Forman, E. M., Moitra, E., & Farrow, V. (2008). The assessment of present-moment awareness and acceptance: The Philadelphia Mindfulness Scale. *Assessment, 15*, 204–223. doi:10.1177/1073191107311467

Cazzulino, F., Burke, R. V., Muller, V., Arbogast, H., & Upperman, J. S. (2014). Cell phones and young drivers: A systematic review regarding the association between psychological factors and prevention. *Traffic Injury Prevention, 15*, 234–242. doi:10.1080/15389588.2013.822075

Chambers, R., Lo, C., & Allen, N. B. (2008). The impact of intensive mindfulness training on executive cognition, cognitive style, and affect. *Cognitive Therapy and Research, 32*, 303–322. doi:10.1007/s10608-007-9119-0

Chiesa, A., Calati, R., & Serretti, A. (2011). Does mindfulness training improve cognitive abilities? A systematic review of neuropsychological findings. *Clinical Psychology Review, 31*, 449–464. doi:10.1016/j.cpr.2010.11.003

Drews, F. A., Yazdani, H., Godfrey, C. N., Cooper, J. M., & Strayer, D. L. (2009). Text messaging during simulated driving. *Human Factors, 51*, 762–770. doi:10.1177/0018720809353319

Feldman, G., Greeson, J., Renna, M., & Robbins-Monteith, K. (2011). Mindfulness predicts less texting while driving among young adults: Examining attention- and emotion-regulation motives as potential mediators. *Personality and Individual Differences, 51*, 856–861. doi:10.1016/j.paid.2011.07.020

Hafetz, J. S., Jacobsohn, L. S., Garcia-Espana, J. F., Curry, A. E., & Winston, F. K. (2010). Adolescent drivers' perceptions of the advantages and disadvantages of abstention from in-vehicle cell phone use. *Accident Analysis and Prevention, 42*, 1570–1576. doi:10.1016/j.aap.2010.03.015

Hancock, P. A., Lesch, M., & Simmons, L. (2003). The distraction effects of phone use during a crucial driving maneuver. *Accident Analysis and Prevention, 35*, 501–514. doi:10.1016/S0001-4575(02)00028-3

Horrey, W. J., Lesch, M. F., & Garabet, A. (2008). Assessing the awareness of performance decrements in distracted drivers. *Accident Analysis and Prevention, 40*, 675–682. doi:10.1016/j.aap.2007.09.004

Jha, A. P., Krompinger, J., & Baime, M. J. (2007). Mindfulness training modifies subsystems of attention. *Cognitive, Affective, & Behavioral Neuroscience, 7*, 109–119. doi:10.3758/CABN.7.2.109

Kabat-Zinn, J. (1990). *Full catastrophe living: Using the wisdom of your body and mind to face, stress, pain and illness*. New York, NY: Delacourt.

Keng, S., Smoski, M. J., & Robins, C. J. (2011). Effects of mindfulness on psychological health: A review of empirical studies. *Clinical Psychology Review, 31*, 1041–1056. doi:10.1016/j.cpr.2011.04.006

Konig, C. J., & Waller, M. J. (2010). Time for reflection: A critical examination of polychronicity. *Human Performance, 23*, 173–190. doi:10.1080/08959281003621703

Lesch, M. F., & Hancock, P. A. (2004). Driving performance during concurrent cell-phone use: Are drivers aware of their performance decrements? *Accident Analysis and Prevention, 36*, 471–480. doi:10.1016/S0001-4575(03)00042-3

Moore, A., & Malinowski, P. (2009). Meditation, mindfulness and cognitive flexibility. *Consciousness and Cognition, 18*, 176–186. doi:10.1016/j.concog.2008.12.008

Nelson, E., Atchley, P., & Little, T. D. (2009). The effects of perception of risk and importance of answering and initiating a cellular phone call while driving. *Accident Analysis and Prevention, 41*, 438–444. doi:10.1016/j.aap.2009.01.006

Nemme, H. E., & White, K. M. (2010) Texting while driving: Psychosocial influences on young people's texting intentions and behavior. *Accident Analysis and Prevention, 42*, 1257–1265. doi:10.1016/j.aap.2010.01.019

NHTSA. (2010, September). *Traffic Safety Facts, Research Note: Distracted Driving 2009* (Report No. DOT HS 811 379). Washington, DC: National Highway Traffic Safety Administration. Available at http://www.distraction.gov/research/pdf-files/distracted-driving-2009.pdf

NSC. (2013). *Annual Estimate of Cell Phone Crashes 2011*. Itasca, IL: National Safety Council. Available at http://www.nsc.org/safety_road/Distracted_Driving/Pages/distracted_ driving.aspx

Olmsted, N. M., & Terry, C. P. (2014). Who's texting in class? A look at behavioral and psychological predictors. *Psi Chi Journal of Psychological Research, 19*, 183–192.

Ophir, E., Nass, C., & Wagner, A. D. (2009). Cognitive control in media multitaskers. *Proceedings of the National Academy of Sciences, 106,* 15583–15587. doi:10.1073/pnas.0903620106

Poposki, E.M., & Oswald, F.L. (2010). The multitasking preference inventory: Toward an improved measure of individual differences in polychronicity. *Human Performance, 23*, 247–264. doi:10.1080/08959285.2010.487843

Schlehofer, M. M., Thompson, S. C., Ting, S., Ostermann, S., Nierman, A., & Skenderian, J. (2010). Psychological predictors of college students' cell phone use while driving. *Accident Analysis and Prevention, 42*, 1107–1112. doi:10.1016/j.aap.2009.12.024

Seo, D., & Torabi, M. R. (2004). The impact of in-vehicle cell-phone use on accidents or near accidents among college students. *Journal of American College Health, 53*, 101–107. doi:10.3200/JACH.53.3.101-108

Strayer, D. L., Drews, F. A., & Crouch, D. J. (2006). A comparison of the cell phone driver and the drunk driver. *Human Factors, 48*, 381–391. doi:10.1518/00187200677772 4471

Teper, R., & Inzlicht, M. (2013). Meditation, mindfulness, and executive control: The importance of emotional acceptance and brain-based performance monitoring. *Social Cognition and Affective Neuroscience*, *8*, 85–92. doi:10.1093/scan/nss045

Teper, R., Segal, Z. V., & Inzlicht, M. (2013). Inside the mindful mind: How mindfulness enhances emotion regulation through improvements in executive control. *Current Directions in Psychological Science*, *22*, 449–454. doi:10.1177/0963721413495869

Weller, J. A., Shackleford, C., Dieckmann, N., & Slovic, P. (2013). Possession attachment predicts cell phone use while driving. *Health Psychology*, *32*, 379–387. doi:10.1037/a0029265

Williams, J. M. G. (2010). Mindfulness and psychological process. *Emotion*, *10*, 1–7. doi:10.1037/a0018360

Original manuscript received April 4, 2014
Final version accepted September 7, 2014