CELL PHONE USE WHILE DRIVING: ILLUSORY CONTROL, PERCEIVED ABILITY TO COMPENSATE, AND DISTRACTIBILITY

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Abstract

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The California Wireless Telephone Automobile Safety Act (2006) went into effect in 2008 followed by two additional laws specifically prohibiting text-based communication on an electronic wireless communications device while driving a motor vehicle, effective in 2009 (S. Rep. No. 110-1613, 2006). These laws and similar ones enacted in other states have established the use of wireless devices as unsafe while operating a motor vehicle. Research has continued to examine the negative effects of using a wireless device as well as the impact to drivers resulting from this law. Wireless devices continue to interfere with drivers’ abilities to comply with their primary responsibilities behind the wheel; however, hands-free legislation has not successfully reduced these risks. This study sought to whether distractibility was a better predictor of risky driving, cell phone use and text message use compared to illusory control and perceived ability to compensate. Distractibility was found to be a better predictor and explained more variance in risky driving, cell phone use and text message use compared illusory control and perceived ability to compensate. Outcomes may illuminate better strategies for prevention of communicating on a wireless device while operating a moving vehicle.
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Introduction

Cell phone use while driving has negative effects on drivers’ ability to comply with road signs, maintain safe driving habits and avoid hazards. Many states have implemented state laws to prohibit this risky behavior and other states are gaining interest in doing the same. Specifically, California enacted The California Wireless Telephone Automobile Safety Act (2006) and established the use of wireless devices as unsafe while operating a motor vehicle. The law went into effect in 2008 followed by two additional laws specifically prohibiting text-based communication on an electronic wireless communications device while driving a motor vehicle, effective in 2009 (S. Rep. No. 110-1613, 2006). Drivers over the age of 18 are permitted to use a hands-free device, all drivers are permitted to use cell phones during emergencies, and certain exceptions apply to service workers. First violation results in a $20.00 fine in addition to county processing fees and increases to $50.00 thereafter (S. Rep. No. 110-1613, 2006). In the United States, thirty states and the District of Columbia have banned hand-held devices for novice drivers and 39 states, the Virgin Islands and the District of Columbia have banned this behavior for all drivers. Forty-one states now specifically ban texting while driving for novice drivers while 34 states, Guam and the District of Columbia have banned texting for all drivers (Governors Highway Safety Association, 2011).

The negative effects of using a cell phone while driving have been shown to be worse than the effects from intoxicated drivers (Strayer, Drews, & Crouch, 2006). Speed, following distance, speed recovery time, and brake reaction time are more strongly affected by cell phone use while driving than by driving under the influence of alcohol.
Considering performance decrements from using a cell phone while driving combined with the potential negative outcomes, it is warranted to investigate what factors contribute to why some drivers continue to engage in a higher frequency of this risky behavior. Previous research has identified correlations between illusory control and perceived ability to compensate, with cell phone use while driving (Schlehofer et al., 2010). Distractibility has also been correlated with cell phone use while driving (Charlton, 2009; Kass, Cole, & Stanny, 2007; Patten, Kircher, Oslund & Nilsson, 2004; Strayer & Johnston, 2001; Strayer & Drews, 2007). These factors can also be conceptualized as problematic thinking (illusory control), problematic decision-making (perceived ability to compensate), and/or a problematic personality trait (distractibility). This study intends to compare these psychological factors with reports of driving history and behavior, problematic cell phone and problematic text message use while driving in order to see which factor is a better predictor of these behaviors.

A study by Hammond and Horswill (2001) revealed that men had a higher desire for control resulting in more men who chose higher speeds and drove closer to cars on the road than females. Also, the use of a hands-free device rather than a hand-held cell phone has been shown to increase illusory control (White, Eiser & Harris, 2004). Risk perception of illusory control was shown to be a precursor, or predictor, of intentions to engage in cell phone use while driving (Zhou, Rau, Zhang, & Zhuang, 2012). However, reports of intentions have not always aligned with actual behaviors or opinions of restrictions on this behavior. This pattern was noted by White, Eiser and Harris (2004) who suggest that drivers may downplay their actual perceived risk possibly as a result of
simultaneously admitting to engaging in cell phone use while driving or because drivers focus on physical interference rather than cognitive distractions. Drivers who reported more experience using their cell phone while driving also reported having less perceived probability of an accident because of this behavior (White et al., 2004). In contrast, preference for restrictions on hand-held devices were higher for drivers with low illusory control, high illusory control with high perceived impact and with the use of a hands-free device (White et al., 2004). However, these results may be due to a false sense of safety from hands-free or a perceived ability to compensate for safety concerns.

One study showed that men have more of a tendency than women to rate themselves higher in skill for random scenarios requiring compensatory driving suggesting that there may be a higher frequency of men who misperceived their ability to compensate when using a cell phone while driving (McKenna, Stanier, & Lewis, 1991). In fact, Zhou, Rau, Zhang, & Zhuang (2012) found that men also reported answering more calls while driving than females. Drivers that were more experienced and those who drove the most miles self-reported as having more perceived skill and safety when reversing and when navigating in an unfamiliar area (McKenna, Stanier, & Lewis, 1991). Younger drivers in another study reported the strongest intentions to answer a call, send and read a text message from a cell phone while driving (Zhou et al., 2012).

Using a hands-free versus a hand-held device led drivers to have a higher reported perceived ability to compensate while driving in addition to a higher sense of safety. Both correlations decreased with age (Zhou et al., 2012). This study showed how drivers attempt to compensate for phone use by notifying the other person of their driving status
and limiting call length, specifically for hands-free cell phones. However, since both devices have equally dangerous outcomes when used while driving, these reports show how perceptions do not likely equate to actual abilities to compensate as these drivers are still reportedly engaging in cell use. These compensatory patterns led to a common shared factor between illusory control and perceived ability to compensate while driving, specifically when researching cell phone use (Zhou et al., 2012). Considering how intentions, behaviors and compensatory strategies are connected and yet patterns of driving decrements are still being reported for cell phone use while driving, this study seeks to find out the impact of distractibility while driving.

Based on the distracting nature of using a cell phone while driving, the construct of distractibility may have a stronger correlation than illusory control or perceived ability to compensate. A measure of distractibility, known as the Cognitive Failures Questionnaire (CFQ) has been used to assess perceptual, memory and action failures during normal daily activities (Broadbent, Cooper, Fitzgerald, & Parkes, 1982). The CFQ is a well-validated measure of overall distractibility as it has stable correlations over time compared with similar trait measures. The CFQ was not correlated with other measures assessing a person’s temporary state (Broadbent et al., 1982). High scores on the CFQ are correlated with people who have a large number of minor symptoms of other kinds in a sample of occupational groups. These included obsessional symptoms, fatigue and lack of concentration (Broadbent et al., 1982). Broadbent describes the CFQ as measuring a vulnerability factor based on these findings rather than a response to stress.
The current study will examine the predictive value of illusory control, perceived ability to compensate, and distractibility on risky driving, specifically cell phone use and text messaging while driving. Results may illuminate potential risk aversion strategies for reducing the frequency of engaging in distracting activities while driving and the associated negative consequences. This study may provide useful information to incorporate in prevention programs aimed at reducing cell phone use while driving in the future. For instance, McKenna, Stanier, & Lewis (1991) suggest that an individual’s skills and safety knowledge be reassessed in order for drivers to be sensitized to their underlying susceptibility to not only the potential to use a cell phone while driving but the resulting negative consequences as well.
Review of the Literature

Cell Phone Use While Driving

According to the National Highway Transportation Safety Administration (NHTSA), making/accepting phone calls was the fourth most distracting activity reported in a national survey conducted on 6000 drivers in all 50 United States and the District of Columbia preceded by talking to passengers, adjusting radio, and eating/drinking (Tison, Chaudhary, & Cosgrove, 2011). Another study found the primary activity used on cell phones while driving to be answering a call followed by initiating a call, reading a text and sending a text (Zhou et al., 2012). A study by Poysti et al. (2005) found that age, distance traveled, sex and occupation predicted cell phone use while driving. In addition, the higher the drivers’ self-perception of skill level the more likely they were to have a phone in their car. This pattern may be explained as illusory control as described later and will be measured as a potential psychological predictor of cell phone use while driving.

The study by the NHTSA also revealed that drivers less than 25 years of age were two to three times more likely to read or send text messages (Tison et al., 2011). Drivers’ motivation to answer calls and read texts was based predominantly on the perceived importance of the call rather than for safety or legal reasons. Also, men reportedly make more work-related calls compared to females, while drivers between 18 and 20 years old not only do this behavior out of boredom but also report the highest phone related crash or near-crash incidences (Tison et al., 2011).

This was supported by self-reports of drivers 18-24 years who have experienced the most hazards from cell phone use compared to drivers 65 years or older (Poysti et al.,
In addition, this study showed that occupation, specifically having a higher status position, is correlated with higher incidences of hazards from using a cell phone while driving. Tison et al. (2005) found that while some respondents acknowledged that they slowed down while operating a hand-held device, over half felt that talking on a cell phone did not interfere with their driving performance despite the fact that six percent of self-reported crashes involved the use of a cell phone. Additionally, the majority supported bans and subsequent fines on both cell use and texting while driving (Tison et al., 2011). The inconsistent self-reports may be explained by a misperceived ability to compensate for compounding demands of completing a dual task such as using a cell phone while driving.

The majority of recent research on distracted driving focuses on the correlation between cell phone use and serious impairments on driving performance. Poysti et al. (2005) found age, occupation, and the amount of cell phone use to be predictors of hazards. These hazards have been linked to the disturbances in visual, manual, and cognitive processes (NHTSA, 2012). Performance outcomes for participants using a cell phone have revealed slower reaction times (Strayer & Drews, 2004; Strayer, Drews, & Crouch, 2006; Beede & Kass, 2006; Horrey, Lesch, & Garabet, 2008; Charlton, 2009; Young & Lenne, 2010), slower brake responses, stop times, and closer stop/following distances (Lesch & Hancock, 2004; Strayer, Drews, & Crouch, 2006; Drews, et al., 2008). In addition, drivers using their cell phone had poorer stop light compliance (Lesch & Hancock, 2004; Beck, Yan, & Wang, 2007; Kass, Cole, & Stanny, 2007; Horrey et al., 2008) compared to non-cell phone using drivers. Texting while driving yielded similar
outcomes of slower braking and reaction times, more variability in following distance, poorer lane maintenance, and an increase in collisions (Drews, Yazdani, Godfrey, Cooper, & Strayer, 2009).

Cell phone users also had more occurrences of swerving/drifting (McEvoy, Stevenson, & Woodward, 2006; Drews et al., 2008; Young & Lenne, 2010), crashes/collisions (Strayer & Drews, 2004; McEvoy, Stevenson, & Woodward, 2006; Strayer, Drews, & Crouch, 2006; Beck et al., 2007; Kass et al., 2007; Charlton, 2009), inappropriate speed maintenance (Strayer & Drews, 2004; McEvoy, Stevenson, & Woodward, 2006; Rosenbloom, 2006; Strayer, Drews, & Crouch, 2006; Beede & Kass, 2006; Beck et al., 2007; Kass et al., 2007; Charlton, 2009; Young & Lenne, 2010) and higher occurrences of violations (Beede & Kass, 2006; Beck et al., 2007) compared to drivers self-reported as non-cell phone users. An estimated 24% of crashes involve cell phone use while driving (National Safety Council, 2012). Using a cell phone while driving also led to increased attentional lapses (Poysti et al., 2005; Beede & Kass, 2006), including more contact with pedestrians with a vehicle and reduced ability to follow directions/navigate (Kass et al., 2007; Drews et al., 2008). Clearly, using a cell phone while driving has detrimental outcomes but, based on self-reports of perceived skill level despite a history of driving-related hazards respondents do not seem to have an awareness of this behavioral pattern.

Ibrahim, Anderson, Burris, and Wagenaar (2011) point out that while the level of risk has been established for cell phone use while driving, the inconsistent restrictions, enforcement and punishment across states has led to concerns about the impact,
specifically from a public policy perspective. These authors also highlight the fact that negligent and reckless driving laws already cover this type of risky behavior. Research evaluating the effectiveness of state laws at reducing the use of telecommunication devices while driving is limited, but has found some reduction of this risky driving behavior (McCartt, Braver, & Geary, 2003). However, additional research refutes this trend, finding that hands-free and handheld devices carry equal risks (McEvoy, Stevenson, & Woodward, 2006; Foss, Goodwin, McCartt, Hellinga, 2009; Nelson, Atchley, & Little, 2009).

**Hands-free versus hand-held.**

Researchers have found that banning hand-held devices while driving does not address the factors contributing to the risk. Specifically, some studies found no difference in impairments between hands-free and hand-held phone devices (Haigney, Taylor, & Westerman, 2000; Horrey et al., 2008; McEvoy, Stevenson, McCartt, Woodward, Haworth, Palamara, & Cercarelli, 2005; Patten, Kircher, Ostlund, & Nilsson, 2004). Additional research showed that the type of cell phone conversation was more highly correlated to performance decrements than the type of cell phone device used while driving (Patten, Kircher, Ostlund, & Nilsson, 2004; Rosenbloom, 2006; Strayer & Drews, 2004). Also, alternative telecommunication devices, such as loudspeakers, have reduced impact on driving performance compared to hands-free devices (Ferlazzo, Fagioli, Nocera, & Sdoia, 2008). Related to this, conversation with passengers resulted in higher driving performance compared to the use of cell phones (Drews, Pasupathi, & Strayer, 2008). These results suggest two things. First, hands-free and hand-held devices carry an
equivalent level of risk and second, hands-free restrictions may not be the only effective solution for reducing distracting activities while driving. White, Eiser, & Harris (2004) found that as hands-free use increased, support for legislation against hand held devices increased. Relatedly, Walsh, White, Hyde, & Watson (2008) found that having an increased awareness of the apprehension risk for using a cell phone while driving actually increased intentions to use a cell phone while driving. As performance decrements have shown to be similar for both devices, this data suggests that legislation against hand-held devices may be influencing drivers to misperceive their ability to compensate for risks associated with hands-free cell phones.

**Compensatory processes.**

The use of cell phones while driving increases workload and cognitive demands in potentially harmful ways but there is also evidence to support the idea that the average driver has compensatory processes that allow us to balance multiple task demands. For instance, Haigney et al. (2000) found that drivers reduced speed during cell phone conversation possibly to compensate for the risk. This was also true for older drivers who tended to reduce speed and increased following distance while using a mobile device (Strayer & Drews, 2004) and had higher awareness of potential effects on a stop task activity used to assess readiness to respond to driving interferences that required braking to a stop (Horrey et al., 2008). These findings were supported in a sample of younger and older drivers with reports of reducing speed, pulling over, increasing following distance and stopping as compensatory actions to reduce the risk of talking on a cell phone while driving (Young & Lenne, 2010). Additional results show that drivers consciously avoid
distractions during poor weather or road conditions, during evenings, and around schools (Young & Lenne, 2010).

**Illusory Control**

Illusory control can be defined as an overestimation of one’s ability to control chance-based situations or outcomes based on their own self-perceptions (Friedland et al., 1992; Davis et al., 2000). Research on illusory control compares participants’ decision-making in high and low-stress situations and those with high and low need to avoid unpleasant outcomes or achieve pleasant ones (Friedland et al., 1992; Biner et al., 1998; Biner et al., 2009). The majority of the research on illusory control has used hypothetical and real gambling situations to measure self-perceptions of confidence in obtaining a desirable outcome (Friedland et al., 1992; Biner et al., 1998; Davis et al., 2000; Biner et al., 2009). This can also be considered one’s attitude towards a situation or behavior (White, Eiser, and Harris, 2004; Nemme & White, 2010).

During a series of experiments, Friedland et al. (1992) devised an illusory control measure using a short, four-question survey of hypothetical gambling scenarios. The researchers used this survey to measure illusory control under potentially costly decision-making comparing high and low-stress conditions. The authors found high-stress, preference for prediction and manual control of the wheel to be correlated with illusory control. These results suggest that the illusion of control can be evidenced by patterns of decision-making that encourage more personal involvement, especially in high-stress situations.
In addition, Davis et al. (2000) conducted a naturalistic study comparing participant’s gambling bets on their own dice rolls (illusory control) compared to their bets during other players’ dice rolls (non-illusory control). Participants placed more overall bets and riskier bets as well as wagered more when they were actively involved (shooters) compared to bets on other player’s rolls (non-shooters). Also, confidence ratings of desirable outcomes were higher for shooters than non-shooters. These findings suggest that illusory control can lead to riskier decision-making and potentially riskier outcomes.

Biner et al. (1998) found similar results comparing food-satiated (low-need) and food-deprived (high-need) participants on skill and confidence-in-winning ratings during a card-drawing game. Higher need for a desirable outcome was positively correlated with higher self-reported skill involvement, confidence, and preference for personal involvement during the card-drawing game. These findings indicate that motivation towards a specific outcome can increase illusory control over that outcome.

In a later study, Biner et al. (2009) assessed illusory control with a series of experiments that had participants play a chance-based card game and rate their self-confidence of winning in order to avoid an impromptu speech (high-need) versus give an introductory remark to a group of peers (low-need). Participants also rated their perception of skill involvement. The authors found that a higher need to avoid an aversive outcome increased participants’ self-confidence but was mediated by their perception of skill involvement. These findings, combined with the above research, indicate that confidence ratings are a strong measure of illusory control. Additionally,
since perceptions of skill involvement may mediate this relationship literature on perceived ability to compensate will be reviewed here.

**Illusory Control and Driving Deficits**

In the context of driving, illusory control can result in detrimental even fatal outcomes. Driving may be one of the most common chance-based situations providing personal control, the potential for high-stress and the opportunity for inflated confidence. This put together can result in riskier decision-making.

McKenna, Stanier, and Lewis (1991) surveyed subjects on their own driving skill and that of the average driver on 20 different aspects, as well as asked them to estimate their perceived overall skill and safety level. Both males and females had higher judgments of themselves overall than the average driver, with males perceiving themselves as more skilled than females. In another study, men were also shown to have a higher desire for control while driving than women and chose faster speeds on a simulated driving test (Hammond and Horswill, 2001). Additionally, both sexes judged themselves higher than the average driver on reversing, parking, changing lanes, stopping distance, merging onto motorways, changing lanes on motorways, width of vehicles, giving cyclist/horses sufficient clearance, and navigating in an unfamiliar area (McKenna, Stanier, and Lewis, 1991). The data support the existence of illusory control while driving based on a self-enhancement bias, particularly for males.

Gregersen (1996) sought to find out whether skill-based, in which drivers are given manual and verbal instructions, or insight-based, in which drivers become aware of their own skills and limitations, driver’s training would have greater effects on perceived
and actual driving skill among a group of unlicensed drivers pursuing a license. He hypothesized that overestimation of skill would result from the skilled group compared to the insight group. Estimated skill level on five trials were compared to actual trial outcomes revealing that while the skilled drivers felt there were more able to manage the course, there was no difference in actual performances. Desire for control was found to also affect speed and gap acceptance on a simulated performance test (Hammond & Horswill, 2001). Thus, the research further supports the existence of illusory control while driving and extends the findings to show how illusory control does not correlate to better outcomes on actual performance.

**Illusory Control and Cell Phone Use While Driving**

Considering the effects of illusory control on perceptions of driving and actual performance outcomes the additional effects of engaging in cell phone while driving would likely have comparable or worse outcomes. Attitudes or evaluations about cell phone use while driving give insight about whether drivers intend to engage in this dual task or not. Illusory control was shown to be a significant predictor of intentions to call and text while driving (Walsh et al., 2008, Nemme & White, 2010). Intentions to call and text while driving, in one study, actually increased with more positive attitudes toward cell phone use while driving. Attitudes and intentions predicted actually engaging in sending and reading texts while driving (Nemme & White, 2010), and attitudes predicted behavioral intentions to answer a call while driving (Zhou et al., 2012). Zhou et al. (2012) reported more perceived control and perceived safety in hands free versus hand-held,
indicating that illusory control exists for cell phone use while driving especially in hands-free mode.

Similar to self-enhancement bias affects on driving, White, Eiser, and Harris (2004) showed how optimistic bias effects driver’s risk perceptions of cell phone use while driving. Those participants who had experience using a cell phone while driving (Evers) rated all activities as less risky than those respondents who reportedly had no history of cell phone use while driving (Nevers). The authors identified two factors of risk perception: Risk Impact and Controllability (detectability, immediacy, and probability). Controllability taps into the construct of illusory control. Evers perceived the risk associated with use of cell phone while driving to be not personally detectable and not immediate. The authors also found Evers to have lower perceived probability of an accident resulting from cell phone use while driving and lower preference for restrictions against the behavior. In this study, the illusion of control moderated the effects of perceived ability to compensate for risks associated with cell phone use while driving. Those effects will be discussed in the following sections. This research shows how experience can lead to controllability that may be more illusory for drivers using their cell phone.

**Perceived Ability to Compensate**

Perceived ability to compensate is an estimation of one’s confidence in managing the demands of a task and overcoming a situation despite the risks involved or the interference of additional distracters (Lesch & Garabet, 2004; Horrey, Lesch, & Garabet, 2008). To assess perceived ability to compensate, researchers have used confidence
ratings of ability to compensate for risks and distractions, as well as self-ratings of participant’s perception of the level of risk or distraction involved in an assigned task (Forster & Lavie, 2007). Additional studies provide explanations for why someone might overestimate their abilities, sometimes leading to poor decision-making processes and subsequent adverse consequences (Madhavan & Lacson, 2006).

Lesch & Hancock (2004) assessed this concept by measuring how well calibrated participants were to the effects of distractions on their driving performance by having them complete a measure of confidence after completing a driving test and comparing both. In a study, Horrey, Lesch, & Garabet (2008) compared driver’s perceptions of the distracting effects of cell phone use on their performance outcomes with self-reported rates of their level of confidence prior to completing the driving test. Both Studies indicated that drivers who had a perceived ability to compensate for distractions actually were distracted the most.

Perceived ability to compensate is also conceptualized as perceptual load or the participants’ preconceived idea regarding the weight, difficulty or impact of a situation based on their initial perception. Forster & Lavie (2007) used a computer-based perceptual-load task that required participants to identify a predetermined target from 2 different sets of non-target letters. The first set contained five randomly assigned non-target letters to focus on, high perceptual-load, with the second set containing 5 identical Os, low perceptual-load. Performance outcomes were compared to distractibility scores (Cognitive Failures Questionnaire) (Forster & Lavie, 2007). This research found that people who have a low perceptual load (perceived ability to compensate) have the highest
distracting effects and those who perceive a higher load have lower distracting effects. Related to the current study, if drivers perceive the tasks of using a cell phone and driving as being a low load they risk being more distracted.

According to Madhavan & Lacson (2006), ineffective decision-making can result from cognitive and affective factors. Cognitive factors include sub-optimal situation assessment, which are overestimations of one’s ability to diagnose a situation for potential hazards while strategizing for alternative solutions, and degraded risk perception, which is inaccurate judgments about the level of risk associated with potential hazards (Madhavan & Lacson, 2006). Affective factors include motivation (Ex: time constraints) and decision framing, which formulates the decision making process as a choice between diverting a loss, such as wasted resources, or diverting as a gain (e.g., safety) (Madhavan & Lacson, 2006).

**Perceived Ability to Compensate and Driving Deficits**

In the context of driving, perceived ability to compensate in hazardous or distracting situations can be detrimental due to underestimating or overestimating the level of risk involved or overestimating the ability to compensate. Petridou & Moustaki (2000) classified overestimation of capabilities as a human factor promoting risky behavior with long-term consequences specifically related to road traffic crashes. Drivers who tended to overestimate their ability to compensate for distractions, predominantly young male drivers, had worse performance outcomes compared to those whose assessment was well-calibrated to the potential effects (Horrey et al., 2008). These correlations replicated the findings of Lesch & Hancock (2004) except that they found
females to have a higher frequency of overestimated confidence with worse performance outcomes. Both studies found that older males more accurately estimated performance decrements during distracting activity, but did not necessarily have higher performance scores.

**Perceived Ability to Compensate and Cell Phone Use While Driving**

Perceived ability to compensate, in the context of using a cell phone while driving is understood as the perceived risk impact, perceived ease or difficulty, or the self-reported behavioral control of engaging in this specific dual-task. Studies have shown that while drivers acknowledge the risks involved with this behavior, other motivating factors such as experience (White, Eiser, & Harris, 2004) and driving purpose (Walsh, White, Hyde, & Watson, 2008) may cause someone to misperceive risks leading to an inflated self-perception of compensatory abilities (Nemme & White, 2010).

White, Eiser, and Harris (2004) recruited members of the public, students and staff from a university campus to rate the perception of risk associated with different in-car activities and found cell phone use perceived to be the most dangerous with hands-free perceived as significantly less risky than hand-held. Activities with similar risk include looking at a map and shaving/putting on make-up. Of the two previously mentioned factors of risk perception: risk impact (severity, equitability, and danger threshold) and controllability, risk impact explains how one might gauge their perceived ability to compensate although not necessarily at a conscious level. Participants found the risk of cell phone use while driving to be severe, inequitable and required little influence about the dangers. These data suggests that experience with mobile phone use while
driving can lead to misperceptions of the related risks, particularly the unlegislated risks associated with hands-free devices.

Further research on cell phone use while driving assesses how drivers’ intentions translate to behavior. Nemme and White (2010) focused on intentions to send and receive text messages while driving and the utility of the theory of planned behavior (TPB; as cited in Nemme and White, 2010) to predict use among university students. As part of TPB, the predictive value of perceived behavioral control was assessed for texting while driving. Perceived behavioral control was found to be a significant predictor of intentions to send text messages while driving. Intentions and history of cell phone use while driving were significant behavioral predictors of sending and reading texts.

Similarly, Zhou et al. (2012) also used the TPB to assess its predictive quality of intentions to answer a cell phone while driving, as well as to determine whether perceived behavioral control predicts compensatory decisions. These authors found perceived behavioral risk and control to be a significant predictor of answering intentions with a stronger correlation for hands-free. Young and middle-aged drivers also report higher behavioral frequencies and a greater sense of their own abilities to compensate for hands-free versus a hand-held device with the youngest drivers reporting the highest intentions to answer the call and fewest refused calls (Zhou, Rau, Zhang, & Zhuang, 2012).

**Distractibility**

According to the American Psychological Association, distractibility, as described in the proposed changes for the DSM-5, is “attention too easily drawn to unimportant or
irrelevant external stimuli” (APA, 2012). Difficulties with sustained attention are also referred to as absentmindedness (Ishigami & Klein, 2009). Those who are highly distractible to extraneous stimuli may be more likely to have lower scores of mental ability (Aks & Coren, 1990). For Example, distractibility was found to be negatively correlated with reported frequency of reading books for pleasure and reading magazines (Levine, Waite, & Bowman, 2007). These authors also found distractibility to be positively correlated with instant messaging (IMing). Distractibility is used as diagnostic criterion for disorders such as Attention-Deficit Hyperactivity Disorder, as a facet of mood disturbances recognizable during a manic episode, as a facet of the personality trait disinhibition, described as difficulty concentrating and focusing on tasks or maintaining goal-focused behavior, and as an associated feature of Hoarding Disorder (American Psychological Association, 2012). Researchers have also identified correlations between distractibility and perceptual load, relevant and irrelevant distracters, and across different facets of attention.

A study of distractibility examined the relationships between four different measures of distractibility; auditory distraction task, visual distraction task, associative distraction task, and visual reaction time task, in addition to a concentration questionnaire with raw scores for speed and error. Austin & Hemsley (1978) compared a sample of distracted and undistracted twin pairs based on the four concentration questions to determine distractibility on each task. Only the auditory task yielded distraction errors when compared with the mean reaction time for the visual task during a between tasks product-moment correlation. All within tasks correlations measured were significant, as
well as all speed scores (visual distraction, associative, and visual reaction time tasks). Self and twin reports of susceptibility to distraction and ability to concentrate both had significant correlations. Self-reported concentration and increase in errors on the associative task were also significantly correlated. These results highlight how the distracting effects of an auditory task, such as using a cell phone, can have a distracting impact on a visual task, such as driving. In addition, self and twin reports of distractibility and ability to concentrate may be used as reliable indicators of susceptibility for performance decrements (Austin & Hemsley, 1978).

Broadbent, Cooper, Fitzgerald, & Parkes (1982) as a measurement of distractibility in daily life developed the Cognitive Failures Questionnaire (CFQ). Based on an assessment of minor symptoms in nurses comparing high and low stress wards, high scores on the CFQ have been described as a “vulnerability factor” affecting one’s ability to “resist the effects of stress” (Broadbent et al., 1982). Nurses with high CFQ scores were shown to have more minor symptoms over six weeks in the high stress ward compared to the low stress ward. This may generalize to the task of driving wherein drivers with high CFQ scores may be more vulnerable to the distracting effects of using a cell phone while driving.

Distractibility seems to be moderated by perceptual load. Specifically, Forster and Lavie (2007) suggested that high perceptual load could reduce and even eliminate distracter interference. High perceptual load was defined as six or more irrelevant stimuli. In addition, the authors found that in tasks of low perceptual load, the CFQ could be use as a predictive tool of distractibility. These authors later conducted a series of
experiments to further support these results. Forster and Lavie (2008) confirmed the effects of high perceptual load adding that time constraints, not duration, of distracters had more influence on performance outcomes and that differences were not due to changes in participants’ anticipation of perceptual load or motivation. These results highlight the importance of increasing perceptual load as a potential target for prevention of distractibility.

Ishigami and Klein (2009) examined a possible link between absentmindedness (CFQ scores) and three facets of attention (alerting, orienting, and executive control) using a version of the Attention Network Test (ANT) during a series of experiments tracking response times and accuracy. Participants with high CFQ scores were less accurately oriented and showed greater alerting effects because of an auditory signal versus no sound. Alerting and orienting restrained the effects of the executive control network.

**Distractibility and Driving Deficits**

Recent research on risky driving has focused on distracting activities and has gained attention at the state level regarding the potential negative outcomes from engaging in such activities. Distracting activities include using a cell phone, eating and drinking, talking to passengers, grooming, reading, using PDA or navigation system, watching a video, and changing music. These visual, auditory, manual and cognitive distractions accounted for 20% of injury crashes and 16% of fatal crashes in 2009 according to the National Highway Traffic Safety Administration (NHTSA). Distracted-driving-related crashes, specifically involving cell phones, resulted in an estimated 995
crashes nationwide in 2009 (United States Department of Transportation, 2010).

Additional data compiled by NHTSA showed an estimated 448,000 injuries from crashes resulting from distracted driving in 2009, with the greatest risk involving distracted driving among drivers less than 20 years of age (United States Department of Transportation, 2010).

Correlations exist between drivers who simultaneously use their cell phones and have a pattern of engaging in other risky behaviors such as driving while drowsy, using excessive speeding, more aggressive driving, drinking while driving, running stop signs and having more recent and overall driving violations (Beck et al., 2007). Other risky behaviors reported while driving were eating or drinking, looking at maps, and outside-the-vehicle distractions (Young & Lenne, 2010). Beede & Kass (2006) found cell phones to be the second biggest distracter while driving after changing a musical device. Drivers who reported using a cell phone also said they drive daily, were less likely to use a safety belt and more likely to be in a hurry when driving (Beck et al., 2007).

**Distractibility and Cell Phone Use While Driving**

Strayer and Johnston (2001) conducted two studies to test different hypotheses of distractibility for cell phone use while driving. The first study tested the peripheral-interference hypothesis by determining whether the interference was due to looking away from driving in order to focus on a cell phone device. In order to test this hypothesis, the authors had 24 male and 24 female undergraduate students perform a tracking task using a joystick to guide a computer cursor along a guided pathway. Red and green lights randomly flashed on the screen and participants were instructed to press a button on the
joystick to “brake” for the red lights. In addition, participants were asked to engage in a conversation via handheld, hands-free or listening to radio (control group). Participants were found to have doubled their red light misses equally in both dual-task conditions compared to the control group, which further confirms the distracting effects of cell phone use while driving. However, since both hand held and hands-free had similar distracting effects, the results refute the peripheral-interference hypothesis (Strayer & Johnston, 2001).

The second hypothesis tested was the attentional hypothesis using two different dual-task conditions. Strayer and Johnston (2001) had 24 undergraduate students (12 male, 12 female) participate in a dual-task by performing a simulated driving task in which they had to hold a phone and have a conversation on both an anticipated and unexpected course. The second dual-task involved the exact same directions as the first with the addition of a word-generation task in which the participants had to generate a word based on a prompter word given by the experimenter in order to increase the attentional demands from the first condition. The attentional demands added by the word generation task in the second condition yielded a significant increase in tracking errors especially in the unpredictable course. Not only did the second experiment further refute the peripheral-interference hypothesis but also it supported the attentional hypothesis of distraction for cell phone use while driving (Strayer & Johnston, 2001).

Patten, Kircher, Ostlund, & Nilsson (2004) also found support of the attentional hypothesis. A sample of professional drivers participated in a similar study as Strayer and Johnston (2001) only they drove in an actual car. In addition to completing a peripheral
detection task (PDT) in both hand held and hands free modes, they were also asked to complete a conversation task consisting of complex, simple or no conversation. The results showed that conversation type had more of an effect on the outcome on the PDT than did telephone type. Drivers were less likely to detect road and vehicle changes during complex conversations than when not distracted by a cell phone conversation while driving. However, mean speed decreased with hand-held cell phone use compared to hands-free (Patten, Kircher, Ostlund, & Nilsson, 2004). Further explained, drivers have less reaction time due to the reduced ability to detect, but may try to compensate for attentional demands by slowing down when using a handheld device. These patterns of distraction can lead to serious negative outcomes when traffic demands increase and drivers are using their cell phone simultaneously.

These results are supported in another series of studies on cell phone induced driver distraction. Strayer & Drews (2007) tested the theory of inattention-blindness or the inability to recognize objects while driving due to distractions from engaging in a cell phone conversation. The drivers used a hands-free device and began the phone call prior to beginning to drive in order to monitor the effects of the cell phone conversation. Participants were asked to recall their memory of objects both after naturally observing them and when directed to observe them while driving, on and off their cell phones. Outcomes for recognition memory revealed that drivers had doubled their recall when engaging in a single task versus a dual task, regardless of how long they fixated on object (Strayer & Drews, 2007). Also, this study discriminated between drivers’ focus on relevant and irrelevant information in the driving scene and asked the drivers to rate the
relevance of the object/scenario to safe driving (1=safe, 10=dangerous). The perceived relevance had no effect on attention reallocation; therefore, it was not seen as a conscious decision to become distracted by cell phone use while driving during this study based on drivers’ decision to prioritize one distractible task over the primary driving task.

Additionally, the authors measured brain activity during both single and dual tasks and found that drivers may be experiencing impaired encoding of the information when they initially see it because they are distracted rather than because their memory recall is impaired (Strayer & Drews, 2007). The authors’ final study further tested their explanation of distractibility by instructing drivers to exit at a rest stop during a driving simulation and compared drivers who were conversing on a cell phone device and those who were conversing with a passenger. Researchers observed 50% of drivers who were using their cell phone fail to exit when they approached the outlet compared to 12% of drivers with passengers who failed to complete the task. These results show that even though all conversations can have distracting affects, passengers may moderate the distracting effects by accommodating their conversations to the traffic demands (Strayer & Drews, 2007).

Another aspect of distractibility related to cell phone use while driving is situation awareness. Kass, Cole, & Stanny (2007) conducted a study of situation awareness (SA) comparing novice (unlicensed) and experienced drivers using a driving simulator with hands-free and no phone control groups. Outcomes were measured by number of infractions; collisions, pedestrians hit, speed violations, missed stop signs, and deviations in lane maintenance. In addition, participants were paused during the driving simulation
and asked questions about the exercise to evaluate situation awareness. Experienced drivers answered more SA questions accurately and were more able to follow directions but showed the same driving decrements as novice drivers indicating that dual task interferences affect all drivers. However, when dependent variables were analyzed, novice drivers had poorer performance outcomes on three out of 6 types of infractions. In addition, cell phone drivers experienced significantly more infractions (four out of 6), answered fewer SA questions and had more errors following directions (Kass, Cole, Stanny, 2007).

Charlton (2009) conducted a similar set of studies and also found a significant correlation between cell phone conversation while driving and decreased driver’s performance compared to passenger conversation based on drivers’ speeds, including reaction times and time-to-collision (TTC, deceleration response to hazards). Some cell phone conversors did not decelerate at all to some of the hazards compared to no drivers failing to decelerate in the control and passenger conversation conditions (Charlton, 2009). This study also had participants rate their driving difficulty and interference of conversations, and recollect the traffic hazards. Cell phone users reported more interference compared to passenger conversations with no reported difficulty in driving. In addition, drivers conversing on their cell phone recalled the lowest number of hazards compared to control group with the highest hazard recall (Charlton, 2009). Out of 112 participants, 68.8% had reported crashes compared to 18.8% and 6.3% for passenger and control groups respectively. In the final study, 18 pairs of driver/conversors were given an alerting cell phone that beeped at each hazard during the simulation in order to test
whether a similar technology would reduce the distracting effects of cell phone conversations on the road. Use of the alerting phone reduced speeds at four out of 5 hazards compared to cell phone and passenger conversations. The alerting cell phone also improved reaction times and TTC’s similar to the control group (Charlton, 2009). The alerting cell phone group had four out of 18 crashes which was fewer than the cell phone and passenger conversation groups in the first study, as well as recalled 74.44% of hazards, comparable to the control group and better than the cell phone group in the first study (Charlton, 2009). This research continues to support the attention hypothesis of distractibility and proposes that a better technology could mediate the distracting effects and perhaps be better than current legislation aimed at accomplishing the same outcomes.

This study intends to examine whether distractibility has predictive value for risky driving beyond the predictive value of illusory control and perceived ability to compensate. While illusory control and perceived ability to compensate may partially explain why people continue to use their cell phones, the lack of awareness may be due to an overall characteristic of distractibility. In order to find more efficient ways of reducing this behavior, three predictors will be tested to determine which factor has more variability on risky driving, specifically cell phone use and text messaging while driving. This study will define cell phone use while driving as both hands-free and hand-held devices.
The Current Study

Hypothesis 1

This study predicts that distractibility will explain more variance in frequency of risky driving than illusory control and perceived ability to compensate.

Rationale.

The National Highway Traffic Safety Administration’s 2009 nationwide survey reported that 672,000 drivers (9%) were on a cell phone while driving at any moment during the day. CFQ scores have significantly predicted self-reported automobile accidents (Wallace & Vodanovich, 2003) and were correlated with drivers’ safety behavior (Wallace & Vodanovich, 2003). CFQ scores were correlated with susceptibility for driving errors (Allahyari et al., 2008), as well as with potentially dangerous driving behaviors and self-reports of actual traffic violations (Kass, Beede, & Vodanovich, 2010). The US Department of Transportation has issued a Blueprint for Ending Distracted Driving to encourage remaining states to enact distracted driving laws. In addition, this blueprint will encourage communication with the auto industry and drivers education programs in order to reduce cell phone use while driving. California was one of two states awarded $2.4 million in federal support for pilot program in 2012 in accordance with this blueprint.

Hypothesis 2

This study will find that distractibility will explain more variance in problematic cell phone use than illusory control and perceived ability to compensate.
Rationale.
Nelson et al. (2009) found that even though participants had an accurate perception of the risks from using a cell phone while driving and self-reportedly did not initiate or receive a call, their overall frequency of cell phone use while driving did not correlate with their perceived level of associated risk. Studies show that the diverting attention from driving to hand held or hands free cell phone conversations while driving will cause interferences (Strayer, & Johnston, 2001; Strayer, Drews, & Johnston, 2003; Patten, Kircher, Ostlund, & Nilsson, 2004; Strayer, Drews, & Crouch, 2006; McEvoy, Stevenson, & Woodward, 2007; Strayer & Drews, 2007).

Hypothesis 3
This study will find that distractibility will explain more variance in problematic text messaging than illusory control and perceived ability to compensate.

Rationale.
Strayer and Johnston (2001) found that hand held and hands-free devices caused decrements on simulated driving performance specifically when manipulating the phone while dialing, which is how one initiates and responds to text messages.
Methods

Participants and procedures

The sample consisted of 99 participants who volunteered through Facebook, a social network site. Participants were 18 years of age or older and possessed a class B license issued by the California Department of Motor Vehicles. All participants electronically accepted an informed consent and completed the same version of a self-report survey composed of multiple measures.

Measures

Barkley’s Driving History Survey was used to assess participants’ self-reported driving history including any adverse outcomes, such as citations and vehicle crashes. Mean scores were 6.3(SD=8) and 2.7(SD=0.87) respectively (Barkley & Murphy, 2006).

Barkley’s Driving Behavior Survey- Self-Report Form was used to assess potential risk for accidents and citations. The survey consists of 26 items on a 1-4 Likert scale (not at all, sometimes, often, and very often). Internal consistency reliability is calculated at .81. Self-reports were correlated with reports from others at \( r = .63(p<.001) \) indicating good validity (Barkley & Murphy, 2006).

The Mobile Phone Problem Use Scale (MPPUS, Bianchi & Phillips, 2005) assessed problematic mobile phone use in a self-report survey consisting of 27 items. The MPPUS includes four additional demographic questions addressing age, gender, education level, and income range which will not be used for the purpose of this study. The MPPUS includes six measures of mobile phone use, duration of mobile phone ownership, weekly frequency of usage, frequency of text messaging, number of persons
called, type of usage (social, business, or other) and average mobile phone expenses. However, this study did not assess the monetary impact of mobile phone use. Items on the MPPUS include questions addressing addictive patterns of mobile phone use such as tolerance, escape from other problems, withdrawing, craving, negative outcomes, perceived control of usage and frequency of mobile phone use, and potential social motivators for mobile phone use. Gender did not have a significant impact on mobile phone or problem mobile phone use. The MPPUS had a high internal consistency of 0.93 (Cronbach’s alpha). Construct validity was achieved for frequency of use \( r = 0.45, \ p < 0.01 \), number of persons called \( r = +0.42, \ p < 0.01 \), and the Addiction Potential Scale (APS, \( r = +0.34, \ p < 0.01 \)).

The proposed study also utilized a revised measure of problematic text message use, The Short Message Service Problem Use Diagnostic Questionnaire (SMS-PUDQ, Rutland, Sheets, & Young, 2007). The questionnaire has eight questions consisting of two factors: pathological use and problem use. This study only utilized items 1, 2, and 5 to assess problem use of text messages. These items address salience/preoccupation, tolerance, and salience/compulsivity of using SMS. Internal reliability for the problem use factor was 0.87 (Cronbach’s alpha). The SMS-PUDQ (Rutland, Sheets, & Young, 2007) has been correlated with self-reports of time spent sending \( r(76) = 0.477, \ p < 0.001 \) and receiving \( r(76) = 0.489, \ p < 0.001 \) text messages and the MPPUS \( r(76)=0.741, \ p < 0.001 \).

The proposed study utilized an illusory control questionnaire designed by Friedland et al. (1992) to assess participants’ illusory perceptions of controllability. The
questionnaire consists of four hypothetical gambling situations: lotto, raffle, NBA, and drawer, measured on a 9-point scale. A higher score reflects more illusory control. Mean scores for each situation were recorded under high and low stress. The mean score for the lotto situation was 4.93 and 7.10. The mean score for the raffle situation was 5.90 and 7.17. The mean score for the NBA situation was 5.30 and 6.45. Lastly, the mean score for the drawer situation was 6.23 and 7.62. These scores reflect a higher need for control in high stress situations. As this was an experimental questionnaire designed for the researchers to validate initial findings of their study reliability and validity statistics were not reported. The questions were based off literature that has researched the differences between internal and external locus of control and relationships to many different facets of decision-making.

As demonstrated by Schlehofer et al. (2010), the proposed study assessed perceived ability to compensate using a 7-point Likert scale for two self-report questions. The first question, ranging from 1 = not at all to 7 = very much, asks participants “To what extent can you compensate for using a cell phone while driving?” Second, ranging from -3 = much worse than average, 0 = average, to 3 = much better than average, the participants are asked “Compared to the average student (at your college), to what extent can you compensate for using a cell phone while driving?”

The Cognitive Failures Questionnaire (CFQ, Broadbent, Cooper, Fitzgerald, & Parkes, 1982) was used to assess participant’s level of distractibility on everyday tasks. It consists of 25 items on a 5-point Likert scale, ranging from 0 = never to 4 = very often. The questions cover a variety of cognitive failures including absentmindedness, lack of
concentration, forgetfulness, failures to notice, clumsiness, difficulty decision making, disorganization, and crossness. Participant’s level of distractibility was evaluated based on the total score of all questions. Questions assess perceptual, memory and action failures of daily life over the past six months. The CFQ is considered as a measure of trait rather than state based on test-retest scores and correlations with other credible measures of trait. Scores have been shown to be stable with a test-retest correlation of 0.824\( (n=57) \) for one group and 0.803\( (n=32) \) for another. The initial-final product moment correlation for the CFQ was 0.54\( (n=73) \) compared to the Spielberger’s Trait Anxiety\( (r = 0.65) \) and Rotter’s Internal-External Control \( (r = 0.69) \) (Broadbent, Cooper, FitzGerald, Parkes, 1982).
Results

A hierarchical multiple regression analysis was conducted to predict risky driving, cell phone use, and text message use from illusory control, perceived ability to compensate, and distractibility. To examine the unique contribution of distractibility in the explanation of risky driving, specifically problematic cell phone use and text messaging, three separate hierarchical multiple regression analyses were performed. The predictor variables that explained risky driving, problematic cell phone use and text messaging were entered in two steps for three separate analyses. In step 1, psychological factors (a) illusory control and (b) perceived ability to compensate were entered as independent variables to control for them. In step 2, distractibility was entered as the psychological predictor that we are interested in measuring while still accounting for the potential influence of the others. In the first analyses, risky driving (total score on Barkley’s Driving Behavior Survey) was used as the criterion variable. The second regression used problematic cell phone use (total score on Mobile Phone Problem Use Scale) as the criterion variable and problematic text messaging (total score on SMS Problem Use Diagnostic Questionnaire) was used in the final regression analysis.

One hundred eighty-six respondents consented to complete the online survey. Surveys with less than 80% of the data were determined to be incomplete and were thrown out. In addition, respondents with less than 100% completion for the subscales with a limited number of questions (illusory control, perceived ability to compensate and text messaging) were also thrown out. Of those remaining, 99 participants that answered affirmatively for two inclusion questions (Are you eighteen years or older? and Do you
possess a valid California state-issued driver’s license?) remained in the study. Missing values for remaining participants were imputed using an Expectation-Maximization analysis on SPSS.

Descriptive statistics for driving incidents were based on reports from Barkley’s Driving History Survey. Out of 99 participants, females accounted for over half of the sample (61.6%). The average age of was 39 years ($SD= 14.22, \ n = 99$). Drivers reported an average 30 years driving experience ($SD= 72.92, \ n = 98$) and an average of approximately 210 miles per week ($SD= 236.83, \ n = 97$). All respondents reported having a cell phone with an average of 14 years ownership ($SD= 14.63, \ n = 99$). In addition, they reported an average of 20.32 overall hours spent on their cell phone ($SD= 23.44, \ n = 99$) and 33.64 calls exchanged ($SD= 45.93, \ n = 98$) in a typical week. When asked about time specifically spent sending and receiving text messages (on and off-line) participants reported an average of 10.34 hours ($SD= 14.45, \ n = 96$) in a typical week.

According to the data, out of 99 drivers a total of 933 incidents were reported including having a revoked or suspended license (12), un-licensed driving (83), involved in an accident, crash or “fender-bender” (180), determined at fault in an accident (59), contact with pedestrian or cyclist (1), received speeding ticket (257), failing to obey stop sign/signal (43), cited for reckless driving (13), cited for driving while intoxicated (18), and receiving a parking ticket (326). This is an average of approximately nine incidents per respondent. Participants self-reported an average of 5 total citations to date ($SD= 7.5, \ n = 99$).
A hierarchical multiple regression analysis was conducted to predict risky driving from illusory control, perceived ability to compensate, and distractibility. Additionally, the correlations surrounding the predictor variables were examined (Table 1). All predictor variables were statistically correlated with driving behavior with perceived ability to compensate having the strongest relationship ($r (98) = .444$, $p < .05$) over distractibility ($r (99) = .413$, $p < .05$) and illusory control ($r (99) = .394$, $p < .05$). There was also a moderate positive relationship between distractibility and illusory control ($r (99) = .323$, $p < .05$). In the first step of hierarchical multiple regression, two predictor variables were entered: illusory control and perceived ability to compensate. This model was not significant $F(2, 96) = .041$; $p > .05$ and explained only .1% of variance in driving behavior. After entry of distractibility in step 2 the total variance explained as a whole was 17.6% ($F(3, 95) = 6.78$; $p < .05$). The introduction of distractibility explained an additional 17.5% variance of driving behavior after controlling for illusory control and perceived ability to compensate ($R^2_{\Delta} = .175$; $F(1, 95) = 20.22$; $p < .05$). In the final model distractibility was the only predictor variable to be statistically significant (Beta = .422, $t(99) = 4.5$, $p < .05$). These results suggest that distractibility is a better predictor of risky driving.
Table 1. Hierarchical Regression Model of Driving Behavior

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<tr>
<th></th>
<th>R</th>
<th>R²</th>
<th>R² Change</th>
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<th>SE</th>
<th>B stand. Coeff</th>
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A second hierarchical multiple regression analysis was conducted to predict cell phone use from illusory control, perceived ability to compensate, and distractibility. Correlations surrounding the predictor variables were also examined (Table 2). Cell phone use was statistically correlated with two out of three predictor variables with distractibility having a higher correlation ($r_{(99)} = -0.472$, $p < .05$) over perceived ability to compensate ($r_{(99)} = 0.202$, $p < .05$). There was also a moderate positive relationship between distractibility and illusory control ($r_{(99)} = 0.323$, $p < .05$). Note that the correlation between cell phone use and distractibility is a negative relationship. In the first step of hierarchical multiple regression two predictors were entered: illusory control and perceived ability to compensate. This model was not statistically significant $F(2, 96) = .92; p > .05$ and explained only 1.9% variance in cell phone use. After entry of distractibility in step 2 the total variance explained as a whole was 25.2% ($F(3, 95) = 10.66; p < .05$). The introduction of distractibility explained additional 23.3% variance in cell phone use, after controlling for illusory control and perceived ability to compensate.
In the final model distractibility was the only predictor variable to be statistically significant (Beta = -.487, t(99) = -5.44, p < .05). These results suggest that distractibility is a better predictor of cell phone use.

Table 2. Hierarchical Regression Model of Cell Phone Use

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<th>R²</th>
<th>R² Change</th>
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</table>

A final hierarchical multiple regression analysis was conducted to predict text message use from illusory control, perceived ability to compensate, and distractibility. Correlations surrounding the predictor variables were examined. Text messaging was significantly correlated with all three predictor variables with perceived ability to compensate having the strongest correlation (r(99) = .237, p < .05) over illusory control (r(99) = .208, p < .05) and distractibility (r(99) = .201, p < .05). There was also a moderate positive relationship between illusory control and distractibility (r(99) = .323, p < .05). In the first step of hierarchical multiple regression, two predictors were entered: illusory control and perceived ability to compensate. This model was not significant F(2, 96) = 2.76; p > .05 and explained 5.4% of variance in text message use. After entry of distractibility in Step 2 the total variance explained as a whole was 9.7% (F(3, 95) = 3.38;
The introduction of distractibility explained additional 4.3% variance in text message use after controlling for illusory control and perceived ability to compensate ($R^2 \Delta = .042; F (1, 95) = 4.43; p < .05$). In the final model two out of three predictor variables were statistically significant with illusory control recording a higher beta value (Beta = .218, $t(99) = 2.21$, $p < .05$) over distractibility (Beta = .207, $t(99) = 2.11$, $p < .05$). These results suggest that distractibility is a better predictor of text message use.

Table 3. Hierarchical Regression Model of Text Messaging

<table>
<thead>
<tr>
<th></th>
<th>$R$</th>
<th>$R^2$</th>
<th>$R^2$ Change</th>
<th>$B$</th>
<th>$SE$</th>
<th>$B$ stand. Coeffic</th>
<th>$t$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL IC</td>
<td>0.233</td>
<td>0.054</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL PAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL IC</td>
<td>0.311</td>
<td>0.097</td>
<td>0.042</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL PAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL CFQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The multiple regression results suggest that distractibility can predict driving behavior, cell phone use and text message use above and beyond illusory control and perceived ability to compensate.
Discussion

The main goal of this study was to determine whether distractibility would predict adverse driving outcomes, cell phone use and text message use above and beyond illusory control and perceived ability to compensate. Previous work has shown how driving outcomes, cell phone use and text messaging are correlated with illusory control, perceived ability to compensate and distractibility. The correlations revealed during the regression analyses were consistent with the research. The significant correlations between the predictor variables (illusory control, perceived ability to compensate and distractibility) and the criterion variables help justify testing them together using multiple linear regression.

First, driving outcomes correlated with each of the three predictor variables. In addition, Text message use was also correlated with each of the predictors. Cell phone use correlated with perceived ability to compensate but not illusory control. Interestingly, cell phone use was found to be negatively correlated with distractibility. One explanation could be that despite being distractible this sample of drivers may have had a higher perceptual load resulting in reduced distractor interference (Forster & Lavie, 2007). It is also evidenced by self-reports that these participants have a history of unsafe driving behaviors including cell phone and text message use. It is possible that because these drivers are cell phone users they are more likely to engage in risky driving activities (Beck, Yan, & Wang, 2007). However, less is known about how to predict these potentially dangerous behaviors. This is problematic considering past behavior is a strong predictor of intentions and future behavior (Nemme & White, 2010). Also, distractibility
was correlated with illusory control on all three dependent measures. This is not surprising considering most drivers are not well-calibrated (lack the awareness) to the distracting effects of cell phone and text message use (Horrey, Lesch, & Garabet, 2008). As it stands, these behaviors are being penalized in the state of California under The California Wireless Telephone Automobile Safety Act (2006) and drivers continue to be distracted. In fact, apprehension risk was found to be positively correlated with text message use while driving (Walsh, White, Hyde, & Watson, 2008).

This study determined distractibility to be the best predictor of driving behavior, cell phone use and text message use. The findings support previous research that found distractibility to be a predictor of driving behavior (Wallace & Vodanovich, 2003) and further backs literature that aims to identify psychological predictors of cell phone use while driving (Nemme & White, 2010; Walsh et al., 2008; Zhou, Rau, Zhang, & Zhuang, 2012). These results support previous research on cell phone related distractions and negative driving outcomes (Strayer & Drews, 2004; McEvoy, Stevenson, & Woodward, 2006; Rosenbloom, 2006; Strayer, Drews, & Crouch, 2006; Beede & Kass, 2006; Beck et al., 2007; Kass et al., 2007; Charlton, 2009; Kass, Beede, & Vodanovich, 2010; Young & Lenne, 2010). In addition, this research also adds to studies specifically addressing text messaging while driving which is still fairly limited (Nemme & White, 2010; Tison et al., 2011; Zhou et al., 2012).

Considering the CFQ as the measure of distractibility and its previous applications, these results can be understood as participants having a vulnerability to being distractible to driving stressors such as cell phones and text messaging (Broadbent,
et al., 1982). Some research also refers to this as susceptibility for cell phone related distractions to interfere with driving outcomes (Austin & Hemsley, 1978). Another explanation is the theory of inattention-blindness or an unconscious decision to become distracted by something other than the primary task (Strayer & Drews, 2007).

**Limitations**

This study had limitations in regards to the participants. This study would have also benefited from having a larger sample size. Also, the use of convenience sampling from solicitation postings on Facebook makes it hard to generalize the results to the larger population of drivers.

**Future Research**

This study shows the predictive value of distractibility and how testing for this psychological trait can identify drivers who are vulnerable to distracted driving, specifically using a cell phone and text messaging. Risk aversion strategies for distracted driving could include a distractibility test to determine a driver’s risk prior to obtaining a license. This strategy could increase drivers’ awareness and potentially lead to less risky driving. New technology could incorporate alerting cell phones that has been shown to have improved driving outcomes comparably (Charlton, 2009). Replacing punitive laws for educational strategies that encourage safer driving may provide better results for reducing distracted driving, specifically cell phone and text message use while driving. Future studies could focus on assessing whether different interventions are more successful at reducing cell phone use and text messaging while driving.
References


Appendix A

Driving History Survey

Instructions: Please answer the following questions to the best of your recollection.

Do you currently have a driver's license? (circle one) Yes  No

How long have you been driving? (in years) __________

How many miles do you drive in an average week? (approximately)__________

How many times have you:

Had your license revoked or suspended? _________

Driven without a valid license? _________

Been in an accident or crash while you were driving? (includes minor "fender benders")

_________

Been determined to be at fault in an accident? _________

Struck a pedestrian or cyclist while driving? _________

Received a speeding ticket? _________

Been cited for failing to stop at a stop signal or sign? _________

Been cited for reckless driving? _________

Been cited for driving while intoxicated? _________

Received a parking ticket? _________

In total, how many driving citations have you received to date? ___________

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# Appendix B

## Driving Behavior Survey - Self-Report Form

**Instructions:** For each item below, please circle the number next to each item that represents how frequently you believe that you use each driving skill during your typical driving performance.

<table>
<thead>
<tr>
<th>Items:</th>
<th>Very</th>
<th>Not at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to starting the car, I check all mirrors, adjust the seat (when necessary), and put on the seat belt.</td>
<td>1</td>
<td>2 3 4</td>
</tr>
<tr>
<td>When moving into traffic, I check oncoming traffic, wait my turn, and accelerate properly.</td>
<td>1</td>
<td>2 3 4</td>
</tr>
<tr>
<td>I use directional (turn) signals prior to making a turn or changing lanes.</td>
<td>1</td>
<td>2 3 4</td>
</tr>
<tr>
<td>I turn around and check directly through the rear windshield for any obstacles or people in my way before backing up.</td>
<td>1</td>
<td>2 3 4</td>
</tr>
<tr>
<td>I look directly through the left or right passenger side windows to check my &quot;blind&quot; spots before changing lanes.</td>
<td>1</td>
<td>2 3 4</td>
</tr>
<tr>
<td>I drive at a rate of speed that is within the posted speed limits.</td>
<td>1</td>
<td>2 3 4</td>
</tr>
<tr>
<td>I drive within the marked lane on the highway, and stay on my side of the road on two-lane roads.</td>
<td>1</td>
<td>2 3 4</td>
</tr>
<tr>
<td>I avoid driving in the breakdown lanes or on road shoulders unnecessarily.</td>
<td>1</td>
<td>2 3 4</td>
</tr>
</tbody>
</table>
9. I yield the right of way to other drivers at intersections and traffic rotaries.

10. I react quickly and properly to brake lights when activated on vehicles ahead.
(cont.)

11. I watch ahead of cars in front of me for obstacles that may be in the road.

12. I observe and respond appropriately to traffic signals (e.g., slow at yellow, stop on red).

13. I adjust speed to bad weather conditions affecting traffic and the roadway.

14. I drive at an appropriate distance from vehicles ahead of me (at least one car length for each 10 miles per hour of speed).

15. I brake smoothly to a stop at marked intersections as required.

16. I maintain two hands on the steering wheel while driving.

17. I drive slowly at an appropriate speed when backing up (in reverse gear).

18. I notice and obey posted traffic signs (stop, yield, school zones, merge, etc.).

19. I follow posted route markers (I do not get lost while driving).

20. When parking, I slow to a safe speed and park within the designated space.

21. I maintain attention (eye contact) toward traffic and the road ahead of me while driving.
22. I keep the volume of the car radio, tape player, or CD player at a low enough level that I can hear sirens or other cars' horns.

23. I make sure that passengers riding with me wear their seat belts.

24. I refer to maps before driving through a new area or city.

25. I slow down and move away from maintenance or construction crews working on or near the roadway.


Please circle the number below that best describes your overall driving performance:

1          2              3             4           5               6         7               8          9         10
Poor     Below average    Average/ satisfactory     Above average   Excellent
Appendix C

Mobile Phone Problem Use Scale (MPPUS)

1. I can never spend enough time on my mobile phone.
2. I have used my mobile phone to make myself feel better when I was feeling down.
3. I find myself occupied on my mobile phone when I should be doing other things, and it causes problems.
4. All my friends own a mobile phone.
5. I have tried to hide from others how much time I spend on my mobile phone.
6. I lose sleep due to the time I spend on my mobile phone.
7. I have received mobile phone bills I could not afford to pay.
8. When out of range for some time, I become preoccupied with the thought of missing a call.
9. Sometimes, when I am on the mobile phone and I am doing other things, I get carried away with conversation and I don’t pay attention to what I am doing.
10. The time I spend on the mobile phone has increased over the last 12 months.
11. I have used my mobile phone to talk to other when I was feeling isolated.
12. I have attempted to spend less time on my mobile phone but am unable to.
13. I find it difficult to switch off my mobile phone.
14. I feel anxious if I have not checked for messages or switched on my mobile phone for some time.
15. I have frequent dreams about the mobile phone.

16. My friends and family complain about my use of the mobile phone.

17. If I don’t have a mobile phone, my friends would find it hard to get in touch with me.

18. My productivity has decreased as a direct result of the time I spend on the mobile phone.

19. I have aches and pains associated with my cell phone use.

20. I find myself engaged on the mobile phone for longer periods of time than I intended.

21. There are times when I would rather use the mobile phone than deal with other more pressing issues.

22. I am often late for appointments because I am engaged on the mobile phone when I shouldn’t be.

23. I become irritable if I have to switch off my mobile phone for meetings, dinner engagements, or at the movies.

24. I have been told that I spend too much time on my mobile phone.

25. More than once I have been in trouble because my mobile phone has gone off during a meeting, lecture or in a theatre.

26. My friends don’t like it when my mobile phone is switched off.

27. I feel lost with my mobile phone.
Appendix D

The Short Message Service Problem Use Diagnostic Questionnaire (SMS-PUDQ)

1. I feel preoccupied with using text messaging. (I think about previous text message activity or anticipate next opportunity to use text messaging)
2. I feel the need to use text messaging with increasing amounts of time to achieve satisfaction.
3. I use text messaging longer than originally intended.

Appendix E

Hypothetical Gambling Situations (Illusory Control)

1. The "lotto" situation.
   Imagine that you are in the process of buying a "Lotto" ticket. Which of the two options would you prefer?
   
a. To fill out the ticket with the "Lottomat" (letting the machine choose numbers at random).

b. To mark the numbers manually (choosing the numbers yourself).

Indicate your preference by marking an X in one of the boxes below. The closer the X is to one of the two options, the more you prefer it to the other.

   Lottomat                                               Manual
   [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

2. The "raffle" situation.
   Imagine that you are about to purchase a raffle ticket. Which of the following options would you prefer?
   
a. You choose the ticket yourself.

b. Your best friend chooses the ticket for you.

Indicate your preference by marking an X in one of the boxes below.

   Your best friend chooses                                              You choose
   [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]
3. The "NBA" situation.
Guessing correctly the outcome of an NBA game, in the United States, will earn you $250. Which of the two following options would you prefer?

a. Guessing the outcome before the game is held.

b. Guessing the outcome after the game was held, but before the outcome became known

Indicate your preference by marking an X in one of the boxes below.

<table>
<thead>
<tr>
<th>Guessing before</th>
<th>Guessing after</th>
</tr>
</thead>
</table>

4. The "drawer" situation.
Imagine yourself facing a chest of drawers. Its six drawers are numbered 1 to 6. Inside one drawer is an airplane ticket for a flight abroad. If you open the right drawer, the ticket is yours. Which of the following options would you prefer?

a. Choose the drawer and open it yourself.

b. Let the roll of a die decide which drawer will be opened.

Indicate your preference by marking an X in one of the boxes below.

<table>
<thead>
<tr>
<th>Choose yourself</th>
<th>Let the die choose</th>
</tr>
</thead>
</table>

Appendix F

The Cognitive Failures Questionnaire

The following questions are about minor mistakes which everyone makes from time to time, but some of which happen more often than others. We want to know how often these things have happened to you in the past 6 months. Please circle the appropriate number.

<table>
<thead>
<tr>
<th></th>
<th>Very often</th>
<th>Quite often</th>
<th>Occasionally</th>
<th>Very rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do you read something and find you haven’t been thinking about it and must read it again?</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2. Do you find you forget why you went from one part of the house to the other?</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3. Do you fail to notice signposts on the road?</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>4. Do you find you confuse right and left when giving directions?</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>5. Do you bump into people?</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>6. Do you find you forget whether you’ve turned off a light or a fire or locked the door?</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>7. Do you fail to listen to people’s names when you are meeting them?</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>8. Do you say something and realize afterwards that it might be taken as insulting?</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>9. Do you fail to hear people speaking to you when you are doing something else?</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>10. Do you lose your temper and regret it?</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>11. Do you leave important letters unanswered for days?</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>12. Do you find you forget which way to turn on a road you know well but rarely use?</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>13. Do you fail to see what you want</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
in a supermarket (although it’s there)?

14. Do you find yourself suddenly wondering whether you’ve used a word correctly?

<table>
<thead>
<tr>
<th>Very often</th>
<th>Quite often</th>
<th>Occasionally</th>
<th>Very rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

15. Do you have trouble making up your mind?  
16. Do you find you forget appointments?  
17. Do you forget where you put something like a newspaper or a book?  
18. Do you find you accidentally throw away the thing you want and keep what you meant to throw away – as in the example of throwing away the matchbox and putting the used match in your pocket?  
19. Do you daydream when you ought to be listening to something?  
20. Do you find you forget people’s names?  
21. Do you start doing one thing at home and get distracted into doing something else (unintentionally)?  
22. Do you find you can’t quite remember something although it’s “on the tip of your tongue”?  
23. Do you find you forget what you came to the shops to buy?  
24. Do you drop things?  
25. Do you find you can’t think of anything to say?

<table>
<thead>
<tr>
<th>Very often</th>
<th>Quite often</th>
<th>Occasionally</th>
<th>Very rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Appendix G

Informed Consent

Through the course of this survey please be aware of the following:

In order to participate you must be 18 years or older. Furthermore, participation is not required and you may elect to withdraw from the study at anytime. There are no benefits for participation. The purpose of this study is to identify possible psychological predictors of drivers who engage in cell phone use while driving. There are no apparent risks of participating in this survey. All data will be kept anonymous, stored on a password-protected computer, and destroyed in five years. This survey will take approximately 15-20 minutes to complete and all information collected will be completely anonymous. Make sure to read all the instructions and questions carefully and choose the best answer for each (usually your first instinct in the best). Please print this informed consent form now and retain it for your future reference. If you agree to voluntarily participate in this research as described, please click on the link below to begin the survey. Thank you for your participation in this research. If you have any questions or concerns feel free to contact the principal investigator, Jennifer N. Mills, at jnm23@humboldt.edu or (951) 764-7070, the major professor Dr. Emily Sommerman at es47@humboldt.edu or (707) 826-3270. If you have any concerns regarding this project, or any dissatisfaction with any part of this study, you may contact the IRB Chair, Dr. Ethan Gahtan, at eg51@humboldt.edu or (707) 826-4545. If you have questions regarding your rights as a participant, you may report them to the IRB Institutional Official at Humboldt State University, Dr. Rhea Williamson, at Rhea.Williamson@humboldt.edu or (707) 826-5169.