IT CAN WAIT: CELL PHONE USE WHILE DRIVING AND PRACTICAL SUGGESTIONS FOR BEHAVIOR CHANGE

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ABSTRACT

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For the past few decades since mobile phones have become popularized, cell phone use while driving (CPUWD), mainly texting and calling, has also emerged as a prevalent behavior. The risks associated with it are significant, but there have not been noteworthy reductions in either CPUWD behavior nor in accident rates. Furthermore, the advent of smartphones, voice recognition technology, and built-in displays in cars that connect to phones have made using phones easier, thereby allowing drivers to engage in CPUWD behavior behind the wheel. In addition, CPUWD has not received as much spotlight as have other risky driving behaviors, such as drunk driving or speeding, despite being as dangerous.

This thesis endeavors to bring this issue to people's attention and offer suggestions for combatting it. First, I provide an overview of the dangers of CPUWD, establishing that the behavior critically impairs driving. Then, I describe the current US legislations banning either texting or hand-held phone use while driving, as well as their effects on enhancing road safety. Following that, I analyze the internal and external psychological factors that determine decisions to engage in CPUWD behavior. Finally, based on my examinations, I offer solutions to practically induce behavior changes and prevent CPUWD, emphasizing the need to target the psychological mechanisms underlying the behavior.

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Introduction

We know that using cell phones while driving is dangerous. Or at least most of us do, whether or not we drive. However, our driving behaviors speak differently. Despite being aware of the perils of distracted driving, many can testify to using their phones (whether hand-held or hands-free) while driving or having been in a car with a driver using a phone, or even both. I myself have been in a number of cars where my friends mindlessly glue their hands, and their minds, to their phones. And I have been disappointed time and time again with their reluctance to detach from their phones. In attempts to prevent them from getting distracted, as a passenger I would offer to hold their phones, text or answer calls on their behalf, or even temporarily confiscate their devices. However, my efforts have generally not been rewarding – my friends would quickly revert to using their phones. Thus, my thesis was born mostly out of my frustration with the dissonance between the awareness of dangers and actual driving behaviors, and a welling sense of duty to evaluate the issue in depth and search for more effective countermeasures.

Distracted driving is a major cause of vehicle accidents. It not only includes cell phone use, but also eating while driving, talking to a passenger, or any behavior that diverts one's attention while driving. However, among those, cell phone use while driving (CPUWD) entails the most risk, among which texting is the most prevalent use. According to the National Highway Traffic Safety Administration (n.d.), texting while driving is equivalent to driving with your eyes closed, and also makes car accidents 23 times more likely to occur than undistracted driving.

Although texting is the most frequently observed CPUWD behavior, drivers use their devices also to make phone calls, set up their GPS, listen to music, and much more. In the 21st

century when communication is as important as ever and staying in the social loop takes precedence for most, drivers struggle to let go of their phones. Moreover, the proliferation of social media platforms and applications have made social networking more convenient, accessible, and easier, thereby luring users to stay connected.

Furthermore, the rapid advancement of technology has innovated computerized systems in smart phones that let users operate their devices without having to touch them. Voice recognition technology has produced virtual assistants, such as Siri and Bixby, that have replaced our physical hands. A simple voice command and the job is done. People can dictate a text and send it without lifting their hands. Or they can command their phones to pull up a map. However, with such convenience come detrimental side effects – it seems to have increased complacency among phone users, fostering the idea that with this technology, it might not be as dangerous to use their phones while driving. As a result, CPUWD as a whole remains largely unaffected.

This thesis, therefore calls attention to the risk of CPUWD. For the purpose of this study, CPUWD, or cell phone use while driving, will mainly refer to texting (both SMS and social media messaging) and calling. Other purposes of phones, such as listening to music or using maps, will be minimally considered, as most of the research on distracted driving has focused less on these and more on communicative uses.

Chapter 1 gives a brief overview of reality of cell phone use and related accident rates. Then, it sheds light on the the dangers of CPUWD, a type of "multitasking," which I argue is an enormous misperception. I break down the issue first by comparing the impacts of texting and calling on driving. Then, I explain how phone conversations and passenger conversations alike jeopardize driving performance. Next, I provide evidence that hands-free uses are not

significantly safer than are hand-held uses, contrary to popular belief. Lastly, I point out that the risks associated with CPUWD are as dangerous as those of intoxicated driving.

Chapter 2 describes the current reality of statewide bans in the United States (as of April 2018). While nearly all of the states implemented some kind of restriction on phone use, studies have reported conflicting findings about the success (or lack thereof) of the legislations. I investigate the problems contributing to this hodgepodge of results and suggest solutions for actually reaping the benefits of CPUWD limitations.

Chapter 3 examines individual psychological factors that may cause people to engage in CPUWD. These include cognitive biases that affect risk perception, which are unconsciously activated, and individual differences, such as addiction and attachment to phones. This chapter aims to fill in the holes in the field that has not extensively looked into psychological variables.

Next, Chapter 4 discusses the external or sociopsychological factors. It focuses mainly on the Theory of Planned Behavior to explain decisions to use a phone while driving. This theory posits that attitude, subjective norms, and perceived control determine intention, which in turn predicts behavior. In addition, group and moral norms, as well as social demands for responsiveness and connectivity, explain why users are more inclined to perform risky driving behavior.

In light of extensive research on the problem, factors, and current state of the issue, Chapter 5 presents recommendations for countermeasures to promote attitude and behavior change to prevent or urge drivers to refrain from CPUWD. Although there exist measures geared toward discouraging CPUWD, they have not proven to be as efficacious as expected. Therefore, I suggest both new interventions and improvements to current ones.

Finally, I provide directions and goals for future research. There needs to be a greater number of studies that examine and experiment with various types of interventions and programs that could bear fruitful results. I also encourage scholars to investigate additional variables that have not been mentioned in this thesis.

Chapter 1: Overview of Cell Phone Use While Driving

Introduction

Overwhelmed by the busyness of the 21st century, people have naturally found ways to make their time commuting more productive. Drivers get distracted behind the wheel by doing their makeup, eating, emailing, texting, and calling – virtually anything. Additionally, with the rapid development of technology, cell phones have now become the most effective and efficient method of utilizing "idle" time on the road. This multifunctional device allows people to do an array of tasks besides simple cellular functions. It is not uncommon to see drivers frequently on their phones responding to Snapchat, skimming through Instagram, and commenting on Facebook while they are driving.

Distracted driving refers to any activity that prevents one from paying full attention to driving. Cell phone use while driving (CPUWD), and texting in particular, is one of the most prevalent distracted driving practices, and by far the most dangerous. Statistics say that texting takes one's eyes off the road for an average of five seconds. For a vehicle running at 55 miles per hour, it is equivalent to "driving the length of an entire football field with your eyes closed" (NHTSA, n.d.). However, despite these obvious dangers of texting while driving, and CPUWD in general, drivers still engage in the behavior (NHTSA, 2016).

This chapter gives an elaborated description of the risks of CPUWD by providing statistics and discussing specific types of CPUWD in detail.

I. Statistics

According to the National Highway Traffic Safety Administration (2018), motor vehicle crashes were one of the leading causes of death in the United States in 2015, especially among young people under the age of 24. Also in 2015, 10% of fatal crashes, 15% of injury crashes, and 14% of police-reported crashes were due to distracted driving (NHTSA, 2017). Distracted driving affected fatalities jumped by 8.8% from 2014 to 2015 (NHTSA, 2016).

In 2016, distracted driving-related accidents decreased by 2.2% from the previous year, but still remains a major cause of motor vehicle deaths, making up about 9.2% of fatal crashes (NHTSA, 2017). Furthermore, drivers in their 20's were the biggest group to get involved in fatal distracted driving crashes (28%), as well as in CPUWD crashes (35%). From 2012 to 2015, the percentage of total crashes associated with distraction remained stable, and the percentage of distraction-affected accidents resulting from CPUWD also barely changed.

The NHTSA (2016) also reported that from 2014 to 2015, hand-held cell phone use while driving did not decrease a significant amount (4.3% to 3.8%, respectively), and the percentage of CPUWD involving visible manipulation of hand-held devices (which include using phones, tablets, and video games) did not change from 2014 (2.2%). Overall, from 2006 to 2015, the rates of using any type of phone remained constant, except for visible manipulation, where there was a steady increase. For different age groups, drivers between the ages of 16 and 24 were found to manipulate devices while driving the most. In addition, there was a general upward trend in hand-held device usage from 2006 to 2015.

II. The Real Dangers of CPUWD – Multitasking is a Misconception

Drivers are generally aware of the perils of using phones while driving. However, many do not internalize these risks and continue to use their phones in-vehicle. Moreover, drivers believe they can multitask and even excel at it. What they do not know, however, is that multitasking is a misnomer, and what is referred to as "multitasking" is actually rapid task-switching, a kind of mental "juggling" (American Psychological Association [APA], 2006). Individuals who use their phones while driving are thus cognitively switching between texting or calling and driving. Shifting attention back and forth from one task to another occurs because both tasks are cognitively demanding but our limited mental capacity does not allow us to execute them all at once. In other words, when both activities require significant engagement and concentration, we are incapable of simultaneously giving them full attention. We then have to allocate our mental resources wisely, choosing to focus on one task over the other.

In addition, more advanced, more mentally loading tasks take longer to switch from one to another because our minds have to recalibrate for each activity. This can be time-consuming especially if both tasks are complex. Constant switching between driving and manipulating phones can have detrimental ramifications, such as delayed responses to hazards. Furthermore, according to cognitive scientist David Meyer, "multitasking" is inefficient and unproductive (Entrepreneur, 2012). Neuroscience professor Earl Miller adds that it can take a toll on creative thinking (Fortune, 2016). With CPUWD, this might result in poor decision-making and information processing on the road, especially when drivers encounter unexpected situations. More research should be done to examine the effects of CPUWD on making decisions in various driving scenarios.

In addition, CPUWD causes manual, visual, and cognitive distractions (Hosking, Young, & Regan, 2009). Manipulation of phones (through hand-held usage) causes drivers to take their hands off the steering wheel, which could easily lead to loss of control over the vehicle. Messaging and checking emails require visual attention, therefore eyes are taken off the road and surroundings, and engagement with phone activities presents cognitive distractions. This section examines common CPUWD behaviors and explains the dangers of each one in depth, ultimately establishing that CPUWD cause serious driving impairments.

A. Texting versus Talking

Texting is notorious for being a colossal distraction to drivers, particularly because it requires manual, visual, and cognitive engagement – all three sources of distractions. On the other hand, talking on the phone is not thought to be as risky, or risky at all. Texting is certainly more dangerous than phone conversations because the former requires more physical maneuvers than the latter. And legislations have taken this fact into account. According to Rocca and Sampaio (2016), much of the 2012 legislative activity focused heavily on regulating texting while driving because it was believed to be the most dangerous type of distracted driving. As of April 2018, the number of texting bans (47 states and D.C.) in the US far exceeds the number of hand-held cell phone restrictions (15 states and D.C.; GHSA, 2018).

However, although texting while driving is riskier than talking on the phone while driving because of visual and greater manual distractions, scores of studies have found evidence that phone conversations are also severely disruptive (Strayer & Drews, 2007). When conversing, people are subject to inattentional blindness, in which attention is diverted to another cognitively loaded task – phone calls in this case. This phenomenon was best demonstrated by

the famous Invisible Gorilla test (Chabris & Simons, 1999). In this experiment, participants were presented a video of people tossing a ball around. They were tasked with counting the number of passes made by the players. However, as the ball was being busily thrown around, a gorilla leisurely walked in and out of the scene, for a total screen time of five seconds. When asked afterwards if they had noticed an unusual event, more than half failed to detect the gorilla. Their intense engagement with the task temporarily blinded them because they had to attend to the dynamic interaction. This is what happens when people are talking on their phones while driving – conversations require significant attention, and as a result, drivers fail to process visual cues in the driving environment.

Furthermore, although conversations lack engaging visual distractions unlike texts (users do not need to look at their phones when talking), they interfere with vision and perception in a different, but equally dangerous manner. Even if eyes are physically off phone screens and fixated on the road, it does not mean that people are retaining visual information (Fitch, Bartholomew, Hanowski, & Perez, 2015; Horrey & Wickens, 2006). Drivers may be looking, but not necessarily seeing. According to the National Safety Council (n.d.), any form of talking on the phone narrows the driver's field of vision by up to 50%.

Strayer and Drews (2007) conducted an experiment in which they compared participants' recognition memory in a single-task condition (driving only) and in a dual-task condition (conversing hands-free while driving). Participants were unaware of the memory test. After the driving simulation, they were asked to identify objects they had seen in the scenery. The experimenters had added filler images of objects that did not actually appear in the scene to test how much attention people paid to their surroundings. Unsurprisingly, the results supported the hypothesis that dual-taskers suffer inattentional blindness. In addition, Strayer and Drews (2007)

suggested that due to the central-processing bottleneck, phone conversations interfere with information from the driving environment because attention is not dividable. This hypothesis postulates that certain tasks just cannot be performed in parallel, but serially, only one operation at a time (Levy, Pashler, & Boer, 2006). Both phone calls and driving are heavily cognitively loaded, and each task is incompatible with the other. As a consequence, people have to attend to one task at a time, although they may not be conscious of their choices when choosing one over the other.

Conversations are distracting also because they often require a considerable amount of attention and engagement, particularly if the topics are complicated (Horrey & Wickens, 2006). Then does this mean that other verbal activities, such as listening to the radio or podcasts, are also mentally occupying, therefore dangerous? Strayer and Johnston (2001) address this question by comparing reaction time and probabilities of missing traffic lights in two simulated driving task conditions: phone conversation and listening to a radio broadcast. Each of these conditions was also subdivided into single- and dual-task conditions. The results indicated that phone conversations significantly slowed down response time and increased the likelihood of missing signals from single- to dual-task conditions. On the other hand, there were no performance deficits due to radio listening, indicating that a dual-task interference was insignificant. Strayer and Johnston (2001) added another control condition, in which participants listened to an audio book and were tested on the content (they were informed about the questionnaire to the task). Again, there was not a significant difference between single- and dual-task conditions in reaction time or probabilities of missing traffic signals. A final analysis of the phone group and combined radio and audio book group revealed that for both dependent variables, the difference between driving and distracted driving conditions was significantly greater in the phone group. These

findings ultimately suggest that the interactive nature of conversations, not just the verbal content, demands a substantial amount of attention, which then compete with the task of driving for cognitive resources.

B. Talking on the Phone versus Talking to a Passenger

It is easy to think that talking on the phone is equivalent to talking to a passenger because both scenarios involve highly engaging conversations. However, in-vehicle conversations provide greater safety benefits than cellular dialogues. The presence of another person in the car means that there is another pair of eyes to look out for potential dangers on the road and alert drivers. Contrariwise, those on the other of end of the phones cannot see the driving environment, therefore are utterly unaware of the road situation. Rather, they add another risk factor to distracted drivers by diverting attention and hindering them from capably detecting any hazards.

Furthermore, since passengers share the same situation awareness with drivers, they can shape the flow of conversation according to traffic demands (Drews, Pasupathi, & Strayer, 2008). When Drews et al. (2008) compared driving performances of drivers in phone conversations, talking with a passenger, and driving undistracted, they noticed that the first condition yielded the most driving errors. Conversations with passengers were more centered around the traffic situation and both the driver and passenger adjusted the intensity of their dialogue according to driving demands. These findings indicate that the disruptive nature of conversations is balanced out by efforts of both participants to take into account driving situations (Strayer & Johnston, 2001).

Passenger conversations do not interfere with driving as much as phone conversations because the traffic status can simply be integrated into and become the topic of the interaction (Drews et al., 2008; Strayer & Drews, 2007). This implies that drivers, as well as passengers, are directing their attention to road conditions, and consequently are less distracted by the conversation. Of course, passenger assistance is limited to the those who can recognize dangers and convey them to the driver – adults would typically be better suited for this job. However, keeping this in mind, individuals driving only with children should especially refrain from CPUWD. In a driving simulation study, Strayer and Drews (2007) observed that 88% of drivers who had passenger conversations made it to the target destination by exiting the correct freeway, but only 50% of drivers talking on a phone succeeded. In the former condition, passengers helped navigate, meaning that they were aware of the traffic dynamics. Moreover, further analysis found that passenger conversations included more discussions about the driving scene than did cellular conversations.

In addition, as Drews et al.'s (2008) analysis revealed, passengers fine-tune the rate and complexity of dialogues in order to accommodate the driving demands (Strayer & Johnston, 2001). If the passenger believes that the driver should focus on driving, they can even cease the conversation. Ishigami and Klein (2009) also add that passengers are less likely to start conversations that might distract drivers.

The purpose of this section is not to advocate talking to passengers – if possible, it is best to refrain from any secondary activities that are unrelated to driving. Rather, the main objective is to underscore the dangers of phone conversations. The absence of a physical interlocutor poses an extreme risk, not only because conversations make drivers detract from attending to their surroundings, but also because there is no one to keep the driver alert even during conversations.

Therefore, it is best advised that drivers hold back from answer or initiating any phone calls while on the road.

C. Hand-held versus Hands-free

Recently, an increasing number of people have started using phones hands-free instead of hand-held, especially with the expansion of laws banning hand-held usage in cars. Developments of technology assisting hands-free usage, such as voice recognition technology (Apple's Siri or Samsung's Bixby), have also facilitated this movement. The apparent lack of visual and manual burdens associated with hand-held manipulation gives people a false sense of security that hands-free phones are better alternatives. In fact, the 2015 Traffic Safety Culture Index reported that 72.8% of drivers surveyed believed that talking on the phone hands-free is safer than on a hand-held device (AAA Foundation, 2016). The survey also found that people tend to approve more of hands-free cell phone use while driving than hand-held phones, with a 2 to 1 ratio. From a sample of 2,545 licensed drivers over the age of 16 in the U.S., 68.6% responded that hand-held phones are unacceptable whereas 63.1% said hands-free phones are acceptable. However, studies have provided evidence that there is no significant benefit to using phones hands-free, and that it is just as risk-laden as hand-held modes.

A study conducted by the Texas A&M Transportation Institute suggested that texting through voice recognition was no less dangerous than manually texting with a hand-held device (Cooper, Yager, & Chrysler, 2011). Regardless of the texting method, texting drivers took twice as long to react to traffic cues as those who were driving without distractions, spent a significantly shorter amount of time looking at the road, and driving performance was equally affected. University of Utah researchers also reported similar findings: conversing on both hand-

held phones and hands-free phones were equally distracting and hazardous in terms of reduced reaction time, debilitated driving performance, increased task workload, and diminished number of glances at hazards on the road (Strayer et al., 2013). These findings were also supported by Ishigami and Klein's (2009) extensive review of previous non-driving, simulated driving, field (naturalistic) driving, and epidemiological studies. Therefore, CPUWD, regardless of mode or purpose (texting or talking), is a threat to road safety.

The illusion that hands-free use is safe even bears a unique risk rarely detected among hand-held users. According to Soccolich, Fitch, Perez, and Hanowski (2014), when drivers are liberated from physical demands of hand-held phones by converting to hands-free usage, they are more likely to engage in other distracting behaviors (e.g. eating). The adoption of extra secondary tasks then presents another source of danger, in addition to existing risks of CPUWD. It is therefore crucial to educate drivers that hands-free and hand-held phone uses are both tremendously dangerous behaviors, and that neither one is better than the other.

D. Comparable to the Risk of Intoxicated Driving

In comparison to CPUWD, intoxicated driving receives a much more negative spotlight, and is widely believed to be morally wrong, shameful, and threatening. CPUWD, on the other hand, despite being a major cause of automobile deaths in the United States, has not resonated with people nearly as saliently. However, there have been empirical evidence suggesting that the dangers of CPUWD are comparable to those of drunk driving. Strayer, Drews, and Crouch (2006) explored the effects of cell phone use (single-task/no use, hand-held, and hands-free) and intoxication (blood alcohol concentration of 0.08% weight/volume) on driving performance.

They analyzed braking responses, speed, and following distance. Although the effects on dependent variable differed between the two driving behaviors and the underlying mechanisms of intoxicated driving and CPUWD are distinct, overall, the results indicate that the impairment due to CPUWD could be as detrimental as those caused by drunk drivers. Redelmeier and Tibshirani (1997) also suggested that the probability of cell phone using drivers getting involved in accidents is proportional to the risk of driving under the influence (DUI). Ensuring that drivers understand that CPUWD is just as dangerous and should be assessed with the same degree of moral standards as drunk driving might immensely improve the traffic safety climate.

Conclusion

As statistical evidence revealed, rates of distracted driving fatalities have not experienced a significant reduction in the past few years. This could partly be explained by the increase in cell phone use in general.

However, it is crucial that people realize how dangerous CPUWD is. Human beings do not have the mental capacity to perform two complex, conscious operations at once. Driving and cell phone manipulation both require considerable attention, and it is impossible for drivers to "multitask." Furthermore, while there is a great emphasis on the risks of texting, there is a need to recognize the hazardous nature of phone conversations as well. In addition, hand-held and hands-free devices have been shown to be equally unsafe because the engagement itself, not the mode of usage, occupies drivers. Lastly, the risk of CPUWD is comparable to the hazards related to intoxicated driving, another dangerous driving behavior that is unequivocally disapproved of by most, if not all.

In order to illustrate how CPUWD is legally addressed, Chapter 2 outlines the bans on texting or hand-held phone use while driving, which vary according to each state. Efficacies of these legislations are also analyzed based on numerous studies.

Chapter 2: Evaluation of Current Laws

I. Overview of Statewide Bans

Cell phone use restrictions are legally implemented by state governments, and not by the federal government. As a result, different states have different degrees of bans, types of enforcements, and targets. For example, as of April 2018, in the state of Texas, there is a texting ban with primary enforcement and a ban on hand-held phone usage in school zones, whereas in South Dakota, texting ban is secondarily enforced and there is no law against hand-held phones (GHSA, 2018). Primary enforcement means that an officer can directly ticket a driver for using a phone. Secondary allows the officer to cite an offender for using a phone only when they are caught violating another law (GHSA, n.d.). In the continental U.S. and Hawaii, the statistics for laws are as follows: (1) 15 states, along with Washington D.C. have primarily enforced hand-held phone bans on all drivers; (2) 20 states and D.C. have an all cell phone ban on school bus drivers (primary); (3) 32 states, D.C. (primary), and six states (secondary) ban all cell phone usage of novice drivers (under the age of 18 or those with learner or intermediate licenses); (4) 43 states, D.C. (primary) and four states ban texting while driving for all drivers, with two states (secondary) only targeting novice drivers (see Figure 2).

As we can see from the figure, the majority of the states enforce texting limitations, but not many go further to ban hand-held usage in general. This concentration of texting bans is a product the legislative activity in 2012 that mainly emphasized texting, which was believed to be the riskiest distracted driving behavior (Rocca & Sampaio, 2016). However, the effects of these bans have been questionable among scholars. Furthermore, there are concerns about the

practicality of enforcement. In order to address these problems, I will discuss the various bans, their outcomes, and difficulties in greater detail in the following section.

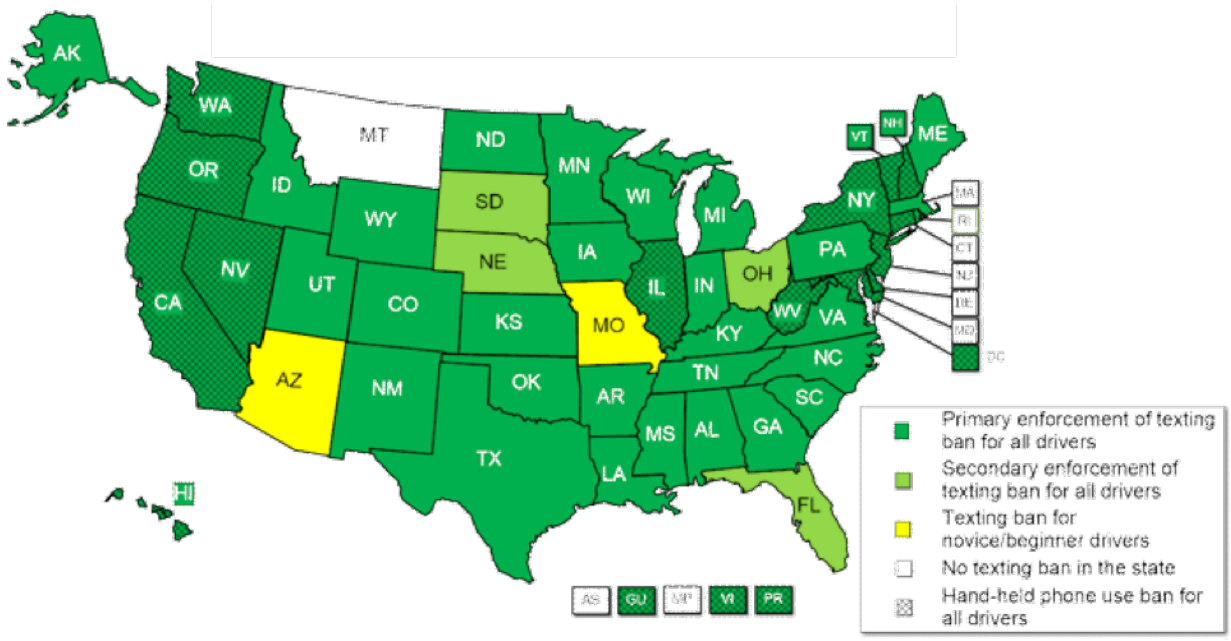

Figure 2. Statewide cell phone use and texting while driving laws in 2017. From "Cell Phone Use and Texting While Driving Laws," by National Conference of State Legislatures, 2017, http://www.ncsl.org/research/transportation/spotlight-distracted-driving.aspx. Copyright 2017 by NCSL.

II. Effectiveness of Bans

With the rise in the number of state laws restricting cell phone use, there has been an escalated interest among traffic safety and public health scholars to examine efficacies of these bans. Studies have investigated if and how various bans (handheld, school zone, texting, and teenage phone use) have impacted CPUWD behavior or CPUWD-related fatal accidents. However, for the past two decades, there have been conflicting reports on the effectiveness of

cell phone laws. Some researchers reported a significant effect, whereas others showed skepticism and apprehension that laws do not seem to be yielding the intended results. While it is impossible to reach a single conclusion about success of CPUWD laws given the differences in state laws and their enforcements, gaining a better grasp of the general post-law conditions might be immensely helpful in developing more effective anti-CPUWD programs.

A quite recent comprehensive research by McCartt, Kidd, and Teoh (2014) analyzed a number of previous studies that examined cell phone use and texting bans in the U.S. and their results. They noticed that texting bans in particular seemed to struggle to bear their intended effects. Moreover, a vast array of studies (single-state, national, and multi-state) that employed differing methods collectively led to the conclusion that notwithstanding the inundation of anti-CPUWD legislations, the effectiveness of laws remains nebulous.

A. Texting Bans

As briefly outlined in the overview, texting while driving bans make up the majority of distracted driving state laws. The first state to enforce an all-driver texting ban was Washington in 2008 (McCartt et al., 2014). Since then, many states have followed in its footsteps. However, despite the proliferation of anti-texting laws, effects were as significant as expected. For example, the Highway Loss Data Institute (HLDI; 2010) examined the relationship between texting bans and collision claims (which usually occur when the driver is responsible, indicating that driver attention may have been distracted). They found that there was no decline in collision claims following the implementation of the law. On the other hand, Rocca and Sampaio (2016) found that primary texting bans may have significantly decreased the number of fatalities. However, this influence, although substantial, was significantly smaller that the effects of hand-

held cell phone bans. Furthermore, secondary texting bans did not establish a significant relationship with fatalities. In addition, some states experienced greater benefits whereas others saw relatively smaller effects, indicating how different the impacts of these bans can be.

Abouk and Adams (2013) also examined crash data from 49 states over a two-year period with each of their texting bans to assess the success of the laws. Like Rocca and Sampaio (2016), they suggest that if bans are primarily enforced, they might be fairly capable of reducing accidents, while secondary enforcements yield less pleasing results. However, regardless of the degree of enforcement, the decrease in accident levels is ephemeral, and they generally bounce back to pre-law levels. The failure to maintain the positive effects for the long term is most definitely a major challenge.

It is important to note that the studies mentioned modeled crashes and deaths, but not observation of texting behavior. This approach implies that texting is difficult to detect, making enforcement extremely challenging for officers (McCartt et al., 2014). In states that only have texting bans and not hand-held phone bans, it is almost impossible to discern whether one is texting or simply setting up a GPS (Abouk & Adams, 2013). With these confusions, it is no surprise that researchers were unable to find significant differences, if there were any changes at all, between pre-law and post-law periods. In addition, even if officers were able to spot drivers texting, if the bans were secondarily enforced, then without drivers violating other offenses, the officers would not have been able to penalize them.

Another issue with secondary laws is that they undermine the seriousness of CPUWD behavior, barely making a dent in drivers' attitudes regarding the act. Such loopholes in the law therefore let motorists still get away with texting while driving, consequently failing to bring down accident rates. In light of these problems, legislators and policy makers should take a more

holistic and stricter approach by not merely targeting texting, but use of hand-held devices as a whole, primarily enforcing laws, and enacting them on *all* drivers, not just specific groups. Perhaps in this way texting laws would be more fruitful and witness their intended effects.

B. Hand-held Phone Bans

In comparison to texting bans, hand-held phone laws have received more attention among scholars. As a consequence, there is an abundance of research evaluating the effectiveness of hand-held bans, albeit also with mixed results. Some have obtained hopeful findings, whereas others add to the uncertainty of the law's strengths.

New York was the first state to ban using hand-held phones while driving (McCartt, Braver, & Geary, 2003). The state has seen positive results, with significant decreases in hand-held phone usage the first couple of months after enactment. However, this effect did not last long. According to a subsequent study on the long-term effects of the ban, use rates returned to previous baseline estimates a year after the ban (McCartt & Geary, 2004). New York was not the only state that experienced an unfortunate restoration of pre-law phone usage – Connecticut and D.C. also observed a rebound to usual levels not long after the implementation of the proscription even though the short-term effects were significant (McCartt, Hellinga, Strouse, & Farmer, 2010). Trempel, Kyrychencko, and Moore (2011) also concluded that California and D.C. did not see significant declines in collision claims due to phone usage at least a year following the ban. Even when the bans target a specific group of drivers (e.g. teenagers), substantial effect was missing. Foss, Goodwin, McCartt, and Hellinga (2009) surveyed parents and teenagers in North Carolina to assess the effectiveness of teenage cell phone restrictions but concluded that there was minimal impact on cell phone use five months into implementation.

On the other hand, Kwon, Yoon and Jang (2014) conducted a turning point analysis for the time when the hand-held ban was implemented and when there was a reverse trend in cell phone related crashes – they found that the two time points coincided. Although it is difficult to firmly establish that the law caused a decrease in accidents, the law can be considered a major contributor to collision reductions. Nikolaev, Robbin, and Jacobson (2010) also supported the effectiveness of hand-held phone bans by comparing pre-law and post-law fatal accident and personal injury rates in several NY counties. They observed that there were significant decreases in average crash rates, suggesting that hand-held phone bans might play a key role in this change. Likewise, Rocco and Sampaio (2016) found that states with primary hand-held phone bans witnessed substantial declines in number of crashes. However, they add that secondary bans were not effective, implying that primary enforcements are crucial in reducing fatalities. Thus, while there is hope for the success of hand-held phone bans, designing them so that results are significant and sustainable is a problem yet to be solved.

One reason hand-held laws did not yield their intended results is the lack of publicity of the law. McCartt and Geary (2004) suggest that initial publicity of the NY law gradually dissipated, which may have contributed to the return to pre-law usage rates. McCartt et al. (2003) and McCartt et al. (2010) also point out that the states they examined did not employ explicit publicized enforcement campaigns, limiting the ban's exposure. This in turn may have restricted the scope of the ban's impact, therefore resulting in a lack of significant reduction in phone usage. Carpenter and Nguyen (2015) similarly suggest that a pre-law education campaign might have led the hand-held ban in the right direction. They conducted a study in Ontario, Canada, where the province implemented a three-month education campaign prior to enacting a cell phone ban. There was a significant decrease in not only hand-held use, but also overall use of

phones among the educated sample. These studies therefore highlight the importance of publicity and education in obtaining the intended effects of cell phone bans.

While there is potential for hand-held phone bans to be effective, an unintended side effect of hand-held phone bans is the increase in hands-free usage (McCartt, Braver, & Geary, 2003). This could also explain why some observation studies have seen overall decreases in usage but not in fatalities. In other words, drivers might substitute hands-free phones for hand-held phones (McCartt et al., 2003). Furthermore, Carpenter and Nguyen (2015) found evidence that while hand-held phone usage decreased after the ban in Ontario, there was a subsequent increase in hands-free use. McCartt et al. (2010) also suggest that on the surface the prohibitions may appear to have successfully reduced hand-held phone use, but there is also a possibility that drivers might have switched to hands-free modes. Thus, they might have found an alternative, instead of discontinuing to use their phones.

The problem with using hands-free devices, however, is that they are just as dangerous as hand-held modes and are even more difficult to detect. Currently, there are no laws that ban hands-free uses for apprehension that they might infringe upon people's freedom. Moreover, given the difficulty of citing drivers for using their phones hands-free, a law that restricts them would be impractical. Therefore, it is important to develop and utilize interventions as well, not merely expending efforts on legal measures, so that drivers are more aware of the dangers of cell phone use in general, regardless of mode, and would eventually restrict usage voluntarily.

Overall, although there have been increases in the number of cell phone use and texting bans, they have not been hugely successful in reducing usage or accident rates. A look into seatbelt laws, which have yielded noticeable positive effects, might provide some takeaways applicable to phone laws.

C. Seatbelt Laws – What to Learn

One domain in vehicle accidents that has seen considerable success in safety laws is seatbelt use. Seatbelt laws were widely implemented in the 1980s, starting in New York. Since then, there has been a general increase in seatbelt use. In fact, the favorable accomplishments of seatbelt regulations have become a model for cell phone restrictions. A myriad of researchers refers to safety belt laws and suggest that their success factors should be adopted to increase effectiveness of CPUWD legislations.

A study on seatbelt use in Michigan found an immediate and significant escalation in the number of drivers using seatbelts right after the mandate (Wagenaar & Wiviott, 1986). However, they also noticed a weakened effect after five months. In response to this, the researchers strongly suggest that long-term success would be guaranteed by primary enforcement and publicity of the law.

Dinh-Zarr, Zaza, and Sosin (2001) supported these proposals when they found evidence that primary enforcements and intensified enforcement programs (e.g. increasing the number of officers checking violations) did indeed increase seatbelt use. Primary enforcements not only make it easier for police officers to ticket drivers, but the degree of enforcement also reflects the importance of seatbelts because the violation can be cited independent of other offenses. This gives drivers the impression that driving without buckling is extremely dangerous. In addition, enhanced enforcement can raise public awareness, and therefore publicity. Increasing the exposure of officers or strengthening the penalty can make people more fearful of being caught, which can translate to increased compliance and attitude change. Furthermore, the famous “Click It or Ticket” enforcement program that was administered from 2000 to 2006 also contributed

greatly to heightened seat belt use (Tison & Williams, 2010). Therefore, in order for cell phone use bans to be successful, states should consider enacting primary laws and implementing enforcement programs to garner more attention to the risks of CPUWD.

III. Conclusion

We have seen that cell phone ordinances vary widely among states, as well as their effects. Overall, texting bans have failed to elicit reductions in texting while driving or fatal accidents. Part of this could be due to the difficulty of identifying texters, especially if hand-held uses are not concurrently banned. However, the effects of hand-held cell phone restrictions have also been uncertain. While there have been short-term decreases in phone use or crashes, the changes did not last.

Yet, despite these discouraging results, there is potential for sustainable effects. Seatbelt laws have also experienced similar patterns in the past, with immediate compliance but a return to normal levels. However, with the adoption of primary enforcement and enhanced publicity, traffic safety greatly benefited with significant increases in seat belt use. Therefore, if cell phone regulations also apply these practices, perhaps we can witness more lasting decreases in cell phone use.

Additionally, although the effectiveness of phone use legislations has not been excellent, and enforcement has been a struggle, this should not undermine the severity of the issue. Rather, given this insight, policy makers and specialists should further explore strategies to raise public awareness about the dangers of CPUWD, such as adopting stronger enforcements or intensifying legislations.

The next chapter explores the internal psychological factors, mainly cognitive biases and individual differences, such as habitual phone use and addiction, that may motivate decisions to use a phone while driving.

Chapter 3: Internal Factors

Introduction

Although CPUWD is a global phenomenon, surprisingly little is known about cognitive and internal psychological reasons drivers use their phones while steering, whether they deliberately choose to or habitually (and subconsciously) do so. By internal I mean "contained within the individual" as opposed to external, which refers to social.

The purpose of this section is to delve into this lacking area and theorize plausible explanations for this behavior. I divide this chapter into two main parts: cognitive biases and non-bias psychological factors. The first section gives an overview of various fallacies and how they shape skill and risk perception, which then influence the degree of CPUWD involvement. I focus on a few key biases (overconfidence, optimism bias, and illusion of control), as they are most labored on in the literature (Kouabenan, 2009). Next, I suggest some non-bias factors that might explain CPUWD behavior.

Currently, there is insufficient research on internal, psychological variables that might explain CPUWD behavior. Much of the current research on this subject has focused only on a few factors such as attention, or have overlooked individual differences affecting CPUWD (Weller, Shackleford, Dieckmann, & Slovic, 2013). In this chapter, I attempt to broaden the scope by delving into the psychology of CPUWD and by laying out and analyzing plausible predictors. I hope that researchers will also further examine and address these variables. Doing so might engender more compelling and practical anti-CPUWD campaigns and interventions to educate and diminish CPUWD behavior.

I. Cognitive Biases and Risk Perception

In his bestseller, *Thinking, Fast and Slow,* renowned psychologist Daniel Kahneman (2011) describes two systems of cognitive processes: System 1 and System 2. The former "operates automatically and quickly," basically intuitively and generally involuntarily (depending on the complexity of the mental activity), whereas the latter "allocates attention to the effortful mental activities that demand it" and is thus a thorough, rational, and reasoned mechanism (Kahneman, 2001, p. 20-21). System 2 is responsible for making conscious decisions, while System 1 makes automatic decisions. In addition, the latter's process is effortless. For example, solving a simple addition equation (e.g. 1+2 = 3) or smiling when your delicious dish is delivered to you belong to System 1 – these do not ask for much thinking, or any at all. Our reactions are almost reflexive. On the other hand, System 2 demands attention – taking an exam calls for this system. Kahneman (2011) explains that Systems 1 and 2 function when we are awake. 1 is on autopilot mode and 2 is on "low-effort mode" (p. 24).

Generally, our intuitions guide us well, but a huge weak spot of System 1 is that it is prone to biases, which are systematic errors in perception and information processing by which judgments and decisions are affected. The automatic processes of System 1 often make us rely on heuristics (p.13), such as the availability heuristics that I will explain in this section. In addition, we tend to be overconfident in what we think we know, be optimistically biased, and be under the illusion of control. All of these are reflected in how drivers perceive their risks of CPUWD, the likelihood of negative consequences, and their CPUWD abilities.

A. Overconfidence

Overconfidence, one of the most well-known cognitive biases, is "greater confidence than reality justifies" (Moore & Schatz, 2017). It is embodied by the discrepancy between beliefs and reality. A moderate dosage of confidence is beneficial, as it enhances performance and morale, but too much of a good thing could lead to self-destruction. Certainly, overconfidence does yield positive consequences; however, misjudgments, risky decisions, and unrealistic outlooks are also produced (Johnson & Fowler, 2011). The term overconfidence is frequently used colloquially, and even oversimplified. In order to illustrate how overconfidence might explain decisions to engage in CPUWD, I will first clarify the specific types as suggested by Moore and Schatz (2017).

Overconfidence manifests itself in three ways: overestimation, overplacement, and overprecision (Moore & Schatz, 2017). Overestimation is thinking that you are better than actually you are (Johnson & Fowler, 2011). In other words, you exaggerate your prowess. People especially judge in favor of themselves with regards to skill-dependent tasks (Deery, 1999). This is how overconfidence is commonly understood among the lay people. Whereas overestimation is solely about the individual, overplacement juxtaposes one with others – you think you are better than others. Lastly, overprecision is absolute certainty in one's insight or grasp of the truth. In this section, I will focus on overestimation and overplacement as factors of CPUWD decision making because prior research has mostly focused on the first two rather than the last aspect of overconfidence (Moore & Schatz, 2017).

We tend to be self-generous when judging our own abilities – we think we are quite outstanding (i.e. better than we truly are). Overestimation is an unsurprisingly easy trap to fall into. Sanbonmatsu et al. (2015 as cited in Sanbonmatsu, Strayer, Biondi, Behrends, & Moore, 2016) suggest that most drivers believe that they can drive safely while using a phone.

Furthermore, people overestimate their multitasking finesse, if such a thing exists. Thus, in terms of safety and multitasking, people believe they are exceptional. Sanbonmatsu et al. (2016) inferred an interesting cycle of overconfidence, multitasking, and self-awareness. In their study, CPUWD undermined participants' self-awareness of their driving, meaning that they were less cognizant of their driving performances when affected by the phone distraction. This in turn confirms their mistaken belief that they are safe and adept multitaskers because they were unable to attentively monitor their driving competency. They hence conclude that cellphone use has little to no effect on their driving, which fosters overconfidence. As a result, they continue their CPUWD behavior and fail to self-regulate – a vicious circle.

Overplacement is another dangerous and prevalent bias. Numerous studies have found that drivers consider themselves more competent than others or the average driver (Delhomme, 1991; Horswill, Waylen, & Tofield, 2004; Svenson, 1981). Universally, the majority of people believe their driving skills to be far superior than those of the average driver. For example, 75% to 90% of Swedish and American drivers, 69% of Polish drivers, and drivers in other various countries overassessed their skills relative to others (Slavic, Fischhoff, & Lichenstein, 1977; Svenson 1981; Svenson, Fischhoff, & MacGregor, 1985; Roslan, 1985; Groeger & Brown, 1989 as cited in Delhomme, 1991). In addition to maneuvering abilities, drivers also believe their risk perception skills are also superior. Horswill et al. (2004) found that drivers evaluated themselves as being more competent at driving, and especially risk perception, than the average UK driver.

Furthermore, Dejoy (1992) and Harré, Foster, and O'Neill (2005) found that young drivers are especially prone to overestimating their skills. When people evaluate their own driving skills as such, they are also optimistically biased about their chances of winding up in an accident, which unfortunately creates a false sense of security. This impression then permits

drivers to increasingly engage in dangerous behavior and less in precautionary behavior (Horswill et al., 2004).

The choice to use a phone while driving (whether it is made consciously or not) might also be explained by the disparity between subjective and objective skills of multitasking. Just as people exaggerate their driving proficiencies, so too they overrate their CPUWD abilities relative to other motorists. A study on middle-aged drivers in San Diego indicated that the majority of the subjects overestimated their CPUWD capabilities, which undoubtedly resulted in an increased frequency of CPUWD behavior (Engelberg, Hill, Rybar, & Styer, 2015). In a similar study that surveyed college students' distracted driving, Hill et al. (2015) found that 46% of the students believed they were highly capable of driving distracted as opposed to 8.5% of other drivers who might be competent. The researchers found that in fact, overconfidence in one's multitasking ability was a strong predictor of CPUWD behavior.

Thus, overconfidence – specifically overestimation of one's own skill and overplacement of one's skill relative to others' – can encourage people to use their phones while driving. Drivers might not be clearly aware of their excessive faith in their ability to safely multitask, and if anything, their *lack* of awareness of their overassessment and their inflated confidence might be why motorists feel justified about engaging in CPUWD behavior or think it is not a tremendously unsafe practice. In other words, they believe that their competency is outstanding enough to balance the inherent risks of distracted driving (Horswill et al., 2004).

B. Optimism bias

Optimism bias is another familiar and major bias that we are often susceptible to. Also known as unrealistic optimism, it refers to the propensity to be exaggeratingly optimistic about

life events – that events would turn out in their favor (Weinstein, 1980). People gauge the likelihood of events occurring relative to others. For positive events, people think they have a higher chance of encountering them; for negative events, they think they are relatively excused from experiencing them. Optimism bias can be a coping mechanism and an "adaptive strategy" to boost self-esteem and positively enhance psychological well-being (Taylor & Brown, 1988 as cited in White et al., 2011; Horswill, Waylen, & Tofield, 2004). However, on the other end, it can be particularly problematic in the risky decision-making domain. When they judge that they are less likely than others to experience negative events, people develop a sense of invulnerability. This consequently discourages people to take precautionary measures, and instead encourages them to engage in hazardous behaviors.

With CPUWD, drivers could be overly positive that their chances ending up in an accident due to distracted driving are low compared to other drivers. According to the aforementioned chain reaction of bias to action (or inaction with regards to preventive actions), when drivers exempt themselves from possible negative events (i.e. motor accidents), they feel invulnerable, thereby becoming less motivated to drive safely and more inclined to use their phones while driving (Nelson, Atchley, & Little, 2009).

The younger generation in particular seems to be more affected by optimism bias (Dejoy, 1992; Harré et al., 2005). They distinguish between correct and incorrect driving behaviors and even acknowledge that drivers their age are generally riskier drivers (Clarke et al., 2005; Finn & Bragg, 1986). However, they tend to not believe they are *personally* prone to such recognized risks (Harré et al., 2005). With regards to *general* risk, young drivers see driving as dangerous, but when asked about their *own specific* risks, they believe their probabilities of accidents are smaller than those of other groups. Moreover, young adults do not even associate themselves

with the accident-susceptible group – they separate themselves from crowd (Finn & Bragg, 1986). As we see in these cases, even when drivers are cognizant of the dangerous reality, this knowledge is not necessarily internalized (Deery, 1999). Unfortunately, more often than not, personal beliefs eclipse objective reality, and people act according to their beliefs.

A study by Finn and Bragg (1986) suggests that young male drivers, on average, perceived their likelihood of accidents to be smaller than that of their peers and older males. It focused on male drivers specifically because young male drivers were more prone to get into accidents than females (Hodgdon et al., 1981 as cited in Finn & Bragg, 1986). When participants were asked to estimate the risk of ten driving situations for (1) their peers, (2) the other age group (young or old), and (3) themselves, younger drivers rated their chances as being significantly lower than those of similar-aged drivers and older drivers. Similarly, older drivers viewed their likelihood of accidents to be lower than that of their peers. While the comparison between young and older drivers' risks does not suggest an optimism bias, both groups separately exhibited this illusion as they rated themselves to be less at risk than their corresponding peers.

C. Illusion of Control

With the illusion of control, the locus of control lies within the individual. People tend to think they have *personal* control over the outcomes of events, even more than they actually have. This fallacy prevails in actions that require skills or personal effort and involvement, such as driving. As such, McKenna's (1993) research on car accident risk perception attempted to observe why people underestimate their chances of negative events. In their study, they asked participants to rate their likelihood of accident involvement both when they are the driver and the

passenger. If individuals underestimated for both conditions, it would imply that optimism bias predominates; if they only underestimated their probabilities in the driver conditions, it would indicate that illusion of control is the prevailing bias. The result supported the second hypothesis – there was a significant main effect for accident probability as a driver as opposed to as a passenger. Notably, driving experience and gender were not significant main effects. The finding, however, does not undermine optimism bias as an explanation for underestimating chances of accidents. Instead, it suggests that the phenomenon can be explained more explicitly by illusion of control. Hence, a possible hypothesis could be that the act of driving (physical maneuver of the vehicle) deceptively makes individuals think that they can control their risks of accident involvement.

To solidify the effect of illusion of control, McKenna (1993) subdivided each of the previous conditions into high- and low-control situations. In the high-control scenario, the participant's car rear-ended the car in front; in the low-control condition, the participant's vehicle was rear-ended. There was a significant interaction between the individual's role (driver or passenger) and degree of control (high or low). There were also significant main effects, which implied perceived controllability. In the driver condition, there was a significant difference between high- and low-control situations, whereas the difference was insignificant in the passenger condition. In the high-control condition, a significant difference was observed for driver and passenger conditions, but not in the low-control scenario. All of these statistical analyses support the effect of illusion of control on developing a sense of invincibility – the "it won't happen to me" belief. It is important to note that while this false feeling of invulnerability appears to be similar to optimism bias, illusion of control is an egocentric perception whereas optimism bias is relative (i.e. compared to others' risks).

However, as mentioned in the Optimism Bias section, perceived controllability can be correlated with optimism bias – these are not two mutually exclusive deceptions. McKenna's (1993) research merely suggests that illusion of control and optimism bias can be identified separately, not that they also operate separately. DeJoy (1989) proposes that optimism bias might be a "byproduct of egocentrism" – we are poor at recognizing the perspectives of others. Consequently, we erroneously conclude that our chances of risks are lower compared to others. The greater one rates oneself as masterful (both in terms of overconfidence and illusion of control), the more optimistic one is about the chances of positive or negative events happening to oneself.

Weinstein's (1980) study about the relationship between perceived controllability and optimism bias found that as the former increased, people were more inclined to believe that their likelihood of encountering negative events was less than average. DeJoy (1989) conducted a similar study to investigate the relationship between various dimensions of accidents and optimistically biased judgments of the probabilities of occurrence. His experiment confirmed the linkage observed by Weinstein, that there is a significant correlation between controllability and optimism. College students were instructed to rate their (1) probability of getting into 10 types of vehicle accidents in comparison to other students and (2) their degree of control. On average, they were more optimistically biased for casualties in which they felt greater control over them, an association also observed by Weinstein (1986).

When drivers have physical, direct, and personal control of the car (since they are steering the wheel), they may think that the control of accidents is also in their hands, that they can also control the likelihood of accidents, as McKenna (1993) has observed. Likewise, when they use their phones while driving, they might believe that they have better control over any

possibilities of collisions resulting from CPUWD. Consequently, drivers captivated by the illusion of control might become psychologically numb to the real risk of distracted driving, once again being more disposed to expose themselves to CPUWD danger.

D. Availability heuristic

When evaluating, judging, or making decisions, our minds often rely heavily on System 1's intuitive and immediate response. One way this process is manifested is through the availability heuristic, by which people estimate the probability or frequency of an event based on how easily they can recall or conceptualize examples (Slovic, Fischhoff, & Lichtenstein, 1980). That is, judgment of the event depends on how availably information (whether objective or subjective) comes to mind.

By nature of heuristics, which are "simple procedure[s] that [help] find adequate, though often imperfect, answers to difficult questions," we "substitute" questions that System 1 can immediately and effortlessly answer for questions that require System 2's input (Kahnemen, 2011, p. 98). Essentially, heuristics are mental shortcuts that help us make scores of decisions and judgments efficiently and in a timely manner (Herbert, 2010, p. 3). If we were to employ System 2 to thoroughly map out solutions to every problem and choice we have to make, we would burn out sooner or later. Thus, heuristics are helpful for the most part because they are energy-efficient and allow us to allocate resources and stamina for more complex decisions. The danger, however, with wholly entrusting heuristics to find answers, with System 2 on cruise control, is that we erroneously oversimplify our assessments of risks, and therefore we make misjudgments.

System 1 oftentimes distorts reality and creates its own version of the world by miscalculating the probabilities of events due to the affective or salient nature of the information conveyed to us (Kahneman, 2011, p. 138). For example, people think that the chance of dying in an airplane crash is greater than the chance of dying in a car accident. In fact, precisely the opposite is true – the airplane is a safer mode of transportation than the car. The National Safety Council reported that in 2016, the odds of dying in a car crash was 1 in 8,013, whereas the odds of dying in a plane accident was 1 in 16,156,376 (National Safety Council, 2016). That is a difference by a factor of 2,016. Common events are usually more accessible in our minds than are rare events because of their frequency, which makes sense (Slovic et al., 1980). However, a number of other factors, such as emotion or novelty of the event, can many times downplay the availability of statistics. Thus, although objectively the frequency of car accidents far exceeds that of plane disasters, the latter is commonly believed to occur more often because examples of plane crashes are readily recalled because such incidents are vivid, more impactful, and sensational. They leave a greater impression on our minds and take on tremendous significance. Even without comparing to car accidents, plane crashes are perceived to occur more frequently than they do in reality, special thanks to media coverage. Sometimes, the more unusual and low-risk events are, the more spotlight they receive, the more ingrained they become in our minds, and therefore appear to be more common than they actually are (Kahneman, 2011, p.138; Slovic, et al., 1980).

In a similar way, personal experiences and memories, or lack thereof, thus can have a substantial impact on how we conceive the prevalence of events. This systematic bias could be applied to CPUWD as well. Those who have personally been involved in CPUWD accidents or have friends, family, or acquaintances affected by them might be more sensitive to the dangers of

CPUWD and perceive the risk to be greater than others think or have a more accurate idea of the risk. On the other hand, those who lack this negative experience might be less perceptive of the true perils of CPUWD. They might even believe that the chance of them getting in a distracted driving accident is much lower than average. Of course, this is not to say that drivers who have gotten into CPUWD accidents are not susceptible to the availability heuristic. However, they would probably have a better idea of the actual danger due to the ease at which they can retrieve that information and recall examples. A study on flood hazard found that people are limited by their experiences when predicting risks of floods because they "[see] the future as a mirror of that past" (Kates, 1962, p. 88 as cited in Slovic et al., 1980). A lack of experience of the disastrous effects of CPUWD can engender misperceptions, which could potentially demotivate people to adopt cautionary attitudes and driving behaviors.

The availability heuristic was found to be significantly correlated with optimism bias (Weinstein, 1980). For negative events, "low" experience could rationalize people's beliefs of the chances of those events happening to them. If people have not experienced car accidents due to CPUWD, nor have acquaintances that have been involved in such incidents, they are more likely to conclude that their chances of CPUWD accidents are lower than that of others (Weinstein, 1980). Hence, for those who lack any negative CPUWD experience will be less likely to believe that they will encounter casualties.

Furthermore, when drivers think of various causes of motor casualties, intoxicated driving may come to mind more often and readily than distracted driving. Statistically, the percentage of accidents caused by drunk driving is greater than that which is associated with CPUWD – they were 28% and 9%, respectively, in 2016 (NHTSA, 2017; NHTSA, 2018). However, research suggests that driving impairments resulting from CPUWD might be

comparable to that of intoxication (Strayer, Drews, & Crouch, 2006; Redelmeier & Tibshirani, 1997). In addition, the perceived severity of drunk driving might make the behavior more memorable and therefore more available for retrieval, making CPUWD seem relatively milder and safer (Sanbonmatsu, Strayer, Biondi, Behrends, & Moore, 2016). Moreover, the intoxicated driving usually receives more news coverage and publicity than CPUWD does. Since people are more exposed to negative reports on driving under the influence (DUI) incidents and alcohol consumption, these events would be more salient and instances would be easier to think of than those of CPUWD.

Despite the plethora of statistical data, the availability bias often guides us in the opposite direction. When we adhere to this bias, this can take a toll not only on judgments but also on consequences resulting those judgments. If people perceive the risk of CPUWD-related accidents less than it actually is or smaller less for them than it is for others based on whatever information or examples are readily available to them, they may rationalize their CPUWD behavior. As a result, they might be less hesitant to use their phones while driving.

II. Non-bias Factors

This section covers other intrinsic variables that determine engagement in CPUWD behavior. People might willfully ignore information that contradict their beliefs about CPUWD, thereby continuing to use their phones while driving. In addition, people who are frequent phone users tend to be addicted or attached to their devices or to social networks, making them helpless inclined to check their phones even if there may not be any notifications or updates.

A. Willful ignorance

Although the statistical facts clearly emphasize the dangers of CPUWD and drivers are generally aware of the inherent risk, they might choose to ignore that information. This rejection is known as willful ignorance, which is defined as "deliberate avoidance of evidence" because "one is so firm in one's belief that any other sources of knowledge are not needed" (Grossman & van der Weele, 2017, p. 1; McIntyre, 2015, p. 4). When people have a certain belief, any information that contradicts it will be rejected. This could be considered a manifestation of cognitive dissonance. In order to reduce the mental discomfort, they reject evidence that is different from their world view. Furthermore, people hate being wrong and like to confirm their current standpoints. Thus, they resist accepting or learning information that disprove them. Willful ignorance is somewhat like confirmation bias – we tend to hold firmly to our beliefs and seek to validate them. Evidence that uphold our ideas we welcome, but otherwise dismiss.

As discussed in the Cognitive Biases section, people tend to perceive CPUWD safety, risk, and skills optimistically. They think it is not as dangerous as others say (or at least for themselves), that they are more immune to accidents than are others, or that they are more skilled drivers. However, in the face of truths that say otherwise, biased drivers might choose to ignore information that affirm the real dangers of CPUWD and refuse to abstain from distracted driving.

B. Phone addiction

During the past decade, since the first iPhone made its grand appearance in 2007 and opened the new digital era of smartphones, phone usage has skyrocketed. It is not unusual to see people constantly checking their phones, picking them up every other second, and even meddling with them even when they are with others. Phone addiction is now a serious problem as users are

rapidly growing attached and dependent on their phones and are constantly occupied with them day and night. The extraordinary technological advancement achieved by phones, which enable people to take care of myriads of tasks with just one device (e.g. browse, take pictures, edit documents), has made phones indispensable appliances in our lives. These gadgets have penetrated into various areas of our lives that even a short moment without our phones is utterly unimaginable. The severity of smartphone addiction has been demonstrated by considerations about enlisting mobile phone addiction in the Diagnostic Statistical Manual – Fifth Edition (DSM-5; Chóliz, 2012). In addition, a study by Lin et al. (2016) proposed criteria to diagnose smartphone addiction, concluding that the symptoms were comparable to that of impaired control, which is one of the sections that addictions are commonly categorized into. Phone addiction is becoming more prevalent, especially as operations of phones are increasing in scope.

Unsurprisingly, cellphone addiction is strongly linked to cellphone usage (Hong, Chiu, & Huang, 2012). These two variables reciprocally intensify each other. The more an individual uses one's phone, the more likely one is addicted, and once addicted, the greater phone usage becomes. Moreover, Brusque and Alauzet (2008) found that substantial phone usage in daily life explains CPUWD. If uncontrolled and unmonitored, everyday phone usage could easily exceed its limits, making people dependent on their phones than they should be. Then, they might frequently and helplessly reach out for their phones (unconsciously) even while driving. Phone addiction should therefore be considered as a possible explanation for CPUWD behavior.

C. FoMO – Fear of Missing Out

Fear of missing out (FoMO) is a relatively new social phenomenon (a fresh 21st-century construct) common among millennials in which users apprehend feeling left out of social

connections. They dislike being absent from and not being up to date with what their friends are doing (Przyblyski, Murayama, DeHann, & Gladwell, 2013. In order to alleviate such feelings, they constantly check their phones to keep up with events, conversations, and information. This emotional uneasiness is fueled by excessive social media apps and usage, but the anxiety in turn fosters a stronger desire to stay connected on social media (Elhai, Levine, Dvorak, & Hall, 2016). The prevalence of smartphone social media applications has made social networks accessible with far more ease, thereby exponential increasing smartphone usage, to the point that it is problematic (Clayton, Leshner, & Almond, 2015). Therefore, it is no surprise that people go online any time of day, regardless of place, even in the middle of other tasks (e.g. driving) because of FoMO. People, especially young adults, may be motivated to use their phones while driving partially because of this fear (Grohol, 2018). Not a second can go wasted and nothing is more important to them than perpetuating the connection, even if that entails risks of accidents.

D. Habit

Habits might also predict CPUWD behavior. Habits are "learned behavioral responses to situational cues that have become established… through a history of systematic repetition and reinforcement" (Orbell & Verplanken, 2010, p. 374). That is, they are formed through repetition of activities, by which we gradually become inattentive to the meaning or reason underlying our behaviors (Nemme & White, 2010 as cited in Bayer & Campbell. 2012). Additionally, this relationship between frequency of behaviors and habituation also works the other way: once habits are developed, they can further increase frequency. In the case of phones, Peters (2009) found that habit is a significant predictor of cell phone usage. In fact, according to a 2013 AT&T survey on drivers, a striking 43% deemed CPUWD a habit (GHSA, 2013).

Habits are a type of automatic behavior, or automaticity (Bayer & Campbell, 2012). Researchers have defined automaticity as behavior elicited by situational cues – either external or internal (Oulasvirta et al., 2012; Orbell & Verplanken, 2010). Bayer and Campbell (2012) give the example of a texting cue, which could take on various forms, including a vibration or an audible ring, a visible notification, our mental states, or even the very presence of the phone. In response to such triggers, people perform certain behaviors (i.e. check the phone), which then become associated with the specific cues. When these cue-response actions are repeated a sufficient number of times, habits are established. This is what Orbell and Verplanken (2010) refer to as "cue contingent automaticity." At this point, behaviors are automatized that we become inattentive to the meaning or reason underlying our behaviors (Bayer & Campbell, 2012; Peters, 2009). In other words, our responses to cues become reflexive because our actions are no longer consciously (or barely) performed.

Oulasvirta, Rattenbury, Ma, and Raita (2012) specified that smartphone use is characterized by "checking habits." These habits are "automated behaviors where the device is quickly opened to check the standby screen or information content in a specific application" (p. 107). It is implicated that checking is not cognitively loading. In addition, instant gratification warranted by smartphones keeps users checking their devices. Furthermore, information and entertainment provided by phones relieve people from boredom, which is another reason why they are motivated to frequently check their phones in search of new rewarding content. By this logic, Oulasvirta et al. (2012), in line with Peters (2009) findings, conclude that habits might increase overall phone usage. They add that checking habits even function as a "gateway" to other phone applications. For instance, when a user views a text message, he or she might start browsing the Internet or scrolling through Facebook, even though that was not their original

intention. This habit opens more opportunities for people to use their phones, therefore increasing phone usage.

To an extent, habit is intensified by frequency of behavior through repetition. However, Bayer and Campbell (2012) interestingly suggest that habit (precisely automaticity), not just frequency of behavior, is a strong predictor of texting while driving. Indeed, frequency of phone usage alone is an important factor for habituation, but the researchers emphasize that the degree of *unconsciousness* of the behavior, irrespective of prevalence, is critical as well. The more automatic texting behaviors are (and in addition to extensive phone use), the more likely people are to use their phones while driving.

Oulasvirta et al. (2012) draw attention to an important linkage between habit and addiction. Once behavior is overly triggered by external cues, such as the phone itself or its content, the habit might metamorphose into addiction. When people cannot effectively self-regulate or lack control over their phone usage, they will be more likely to engage in CPUWD behavior.

Overall, participants did not perceive smartphone use habit in a negative light (Oulasvirta et al., 2012). This might be due to the temporary but immediate relief of boredom, satisfaction with rewarding information, and entertainment provided through phones. However, users should be cautious about smartphone overuse and be aware of the potential for that habit to be carried into a driving setting. They might unconsciously and habitually check or get on their phones regardless of situation, even if it may be driving. Thus, habit may be another predictor of CPUWD.

E. Perceived Attachment to Phone

A somewhat bizarre but equally plausible reason for CPUWD is possession attachment. According to Weller et al. (2013), perceived attachment to objects is a significant predictor of CPUWD, yet largely overlooked. Individuals grow affectionate towards their possessions just as they do for close people. Borrowing from John Bowlby's (1969/1982 as cited in Weller et al., 2013) attachment behavioral system theory and other studies (Grayson & Shulman, 2000) on attachments to possessions, the researchers suggest that people tend to greatly favor (from an early point in life) objects they own that they deem special. In addition, individuals might suffer separation anxiety with their properties somewhat like they would with intimate ones.

Mobile phones are unique in that they enable people to create and connect with social network. Weller et al. (2013) indicate that because of this attribute, users might feel especially attached to their phones. In other words, since cell phones function as channels that connect individuals, and people experience a sense of identifying with and belonging in social groups (Walsh, White, & Young, 2009), users consequently grow attached to their devices.

Furthermore, Weller et al. (2013) offer an inverse relationship between perceived attachment to phones and perceived risks of CPUWD and the positive effect of that association on CPUWD behavior. The inverse relationship states that as perceived attachment increases, perceived risk decreases. They grounded this hypothesis on the affect heuristic, whereby affect, or feelings, influence risk perception. Since attachment necessarily entails affect (Kogut & Kogut, 2011), the fonder one grows toward a behavior, the less risky it appears to one. And as risk perception becomes more positive, the more likely drivers are to use their phones while driving (as it is thoroughly explained in the Cognitive Biases section). The findings of Weller et al. (2013) supported their hypotheses (a) that cell phone attachment does indeed predict CPUWD

(which includes calling, texting, and using social media in their study) and (b) that perceived attachment and perceived risk are inversely related. Therefore, attachment to one's cell phone is another factor that might enhance distracted driving behavior.

Conclusion

In sum, cognitive biases can impact perceptions of risk and individual ability of CPUWD. These in turn might determine the extent to which drivers actually engage in the behavior. As for other individual differences, frequent phone use in everyday lives has made users obsessed with their phones and their provisions (connections and entertainment), which might have made it difficult for people to regulate their cell phone use when they are driving. As a result, those who are more attached to their devices would be more likely to use their phones even in vehicle.

In Chapter 3, I explain social and situational determinants of CPUWD. The chapter primarily focuses on various types of norms (subjective in the Theory of Planned Behavior, group, and moral). It also discusses how social demands may compell individuals to use their phones while driving.

Chapter 4: External Factors

Introduction

In Chapter 3, I discussed the internal, individual psychological factors that might predict cell phone use while driving (CPUWD) behavior, such as innate cognitive biases and non-bias individual psychological variables. In this section, I address the external, social factors that also contribute to CPUWD behavior. The Theory of Planned Behavior (TPB) is often used as the model to explain why people choose to carry out a certain action. Strictly speaking, TPB does not identify as an external factor. However, because I will elaborate specifically on subjective norms, I included TPB in this chapter. I also examine moral norms, group norms, and social pressure to stay connected to the social network as predictors of CPUWD behavior.

I. Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (TPB) is a model conceptualized by social psychologist Icek Ajzen to explain how attitude towards behavior, subjective norms, and perceived behavioral control (PBC) influence intention, which leads to behavior (Ajzen, 1991; see Figure 1). This is a theory constructed to predict behaviors in specific contexts, assuming that people are rational decision makers (Conner et al., 2007) and focusing on conscious variables (Bayer & Campbell, 2012). The three variables (attitude, subjective norms, and PBC) are also interrelated. Furthermore, PBC in particular has been shown to not only determine intention, but also behavior, unlike the other constructs.

The TPB has been widely used in distracted driving studies and has received general consensus to be a valid model to explain why people choose or continue to use their phones

while driving despite acknowledgement of risks (Zhou et al., 2009). In general, the more positive the attitude and subjective norms and the greater the PBC, the stronger the intention to perform a given behavior. Also, note that while attitudes and PBC are more individual differences rather than social constructs, in order to use TPB in its entirety to explain CPUWD, I covered them in this chapter in addition to subjective norms.

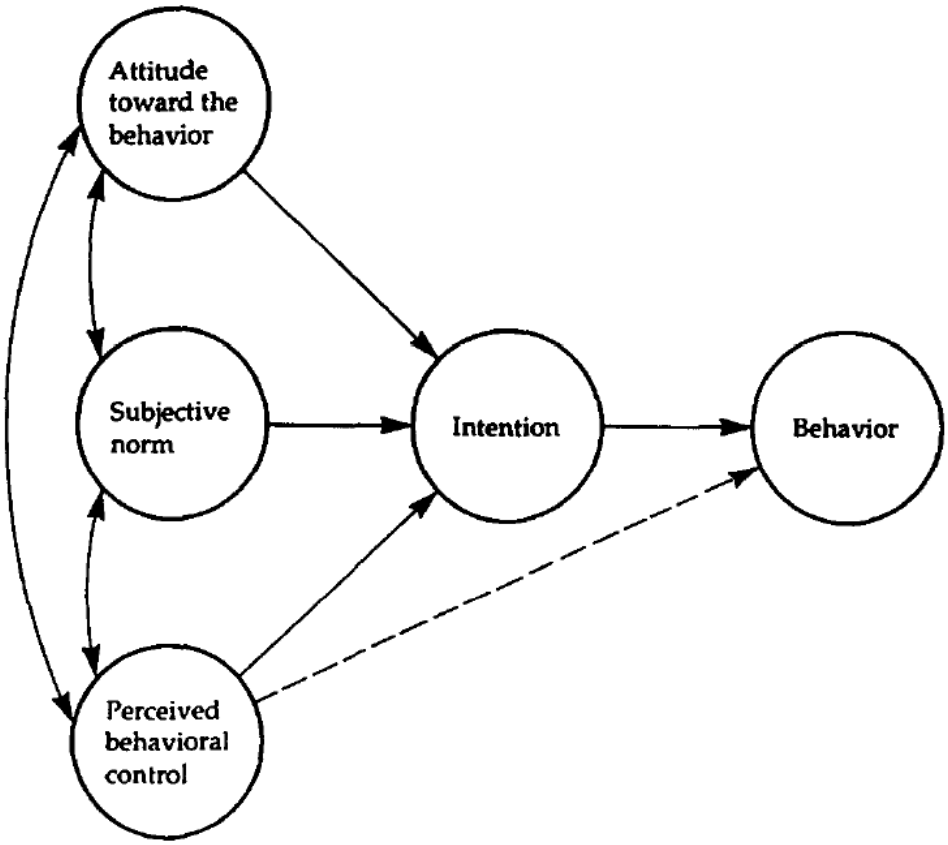

Figure 1. Theory of planned behavior. From "The theory of planned behavior," by I. Ajzen, 1991, *Organizational Behaviour and Human Decision Processes, 50,* p. 182. Copyright 1991 by I. Ajzen.

A. Attitudes

According to Ajzen (1991), attitude is the extent to which an individual favorably or unfavorably assesses the target behavior. Attitudes are formed by behavioral beliefs, which are "perceived positive or negative consequences of performing a behavior and the subjective values or evaluations of these consequences" (Ajzen, 2015, p. 125). The accessible behavioral beliefs about outcomes of a given behavior and the subjective probability of those outcomes determine the attitude toward that behavior, which then dictates intention and subsequent behavior.

Multiple studies have witnessed a significant, positive correlation between attitude and intention and behavior. Therefore, we could easily posit that the more favorably one views CPUWD, the more likely they are to use their phones while driving. Zhou, Wu, Rau, and Zhang (2009) supported this hypothesis by finding a significant correlation between attitude and young drivers' intentions to use handheld and hands-free devices. Regardless of the mode of phone, the more favorable the attitude toward CPUWD behavior was, the stronger the intention was to engage in it. Nemme and White (2010) also observed that attitudes significantly predicted intentions to both send and read texts while driving. Specifically, reading texts while driving was perceived positively, and corresponding intentions were high. Moreover, attitude on sending texts was correlated with sending behavior at follow-up. Similar findings were also noted by Walsh, White, Hyde, and Watson (2008). In their study, attitude emerged as a consistent positive determinant of intention to text or call while driving in various driving scenarios (vehicle speed and time pressure).

Generally, these studies have shown that positive attitudes associated with CPUWD will strengthen the intention to use a phone while driving, which in turn will make the behavior more likely. They have also found that the attitude-intention linkage was considerable whether the

mode was handheld or hands-free, or whether the phone was used to call or text. Thus, a favorable evaluation of CPUWD is a substantial predictor of intention and behavior.

B. Subjective Norms

Subjective norms are "perceived social pressure to perform or not to perform a behavior" (Ajzen, 1991, p. 188). Ajzen (2015) explains that subjective norms are formed by two types of normative beliefs: injunctive and descriptive. These two together frame how social pressures are felt by individuals. Injunctive normative beliefs are shaped by our perceptions of what others think we should do and descriptive normative beliefs are based on what we see others doing (Ajzen, 2015; Cialdini, Reno, & Kallgren, 1990; Fishbein & Ajzen, 2010, p. 133).

The current measures of subjective norm seem to focus more on approval or disapproval of behaviors (hence, injunctive norms), and not the prevalence of the behavior. For example, Nemme & White (2010) formulated their subjective norm questionnaires in terms of how individuals feel like they *should* behave, such as: "Those people who are important to me would approve of me sending/reading SMS messages while driving in the next week" (p.12). This type of inquiry emphasizes the expectation aspect and seems to downplay the role of descriptive norms. In fact, Forward (2009) found that descriptive norm on its own is a significant predictor of intention to speed. Rivis, Sheeran, and Armitage (2006) even observed that descriptive norms often predict intention better than subjective norms do. Numerous studies have been unable to find adequate support for the effect of subjective norm on intention when combined with descriptive norm, thereby suggesting that injunctive and descriptive norms be studied separately (Chen, Donmez, Hoekstra-Atwood, & Marulanda, 2016; Forward, 2009).

1. Injunctive Norms

Injunctive normative beliefs, simply put, are perceptions about what *ought* to be done (Cialdini et al., 1990; Göckeritz et al., 2010). Therefore, injunctive norms are contingent on the approval or disapproval of others, notably those who are important to the individual. Behaviors that seem approved by referents will be encouraged, and those that are disapproved should be more inhibited. To clarify, the studies mentioned in this section that examined subjective norms (but not injunctive norms specifically) will be regarded as focusing on injunctive norms, unless noted otherwise by the researchers.

Zhou et al. (2009) conducted a study on TPB and handheld and hands-free phone use while driving and found that subjective norms (which underscore injunctive norms) was a significant determinant of intention for both modes. Nemme and White (2010) also noticed that the more approval drivers perceived from closer people, the more likely they were to use hands-free phones. They further suggest that this relationship was intensified when approval came from closer people than from general others. Similarly, Carter et al. (2014) found that adolescent drivers were more influenced by peer injunctive norms than by parental norms, which upholds the proposition that expectations and attitudes of more valued individuals weigh more than those of distant people.

In addition, White, Walsh, Hyde, and Watson (2010) observed that continuation of hands-free CPUWD behavior is not only engendered by injunctive normative beliefs, but also, in turn, influences the beliefs. In their study, individuals who frequently used their phones while driving apparently perceived greater approval from others than did infrequent users. Injunctive norms and prevalence of CPUWD therefore seem to be mutually enhancing.

2. Descriptive Norms

Descriptive normative beliefs are what one thinks others do – they focus on what *is* the norm (Cialdini et al, 1990; Göckeritz et al., 2010). In other words, descriptive norms are perceived norms (Fishbein & Ajzen, 2010, p. 133). These often serve as justifications or validations of how to act in a given situation. In essence, it embodies the "everyone else is doing it" mindset. Descriptive norms are not concerned so much with the ethicality or approval as they are with the prevalence or commonality of the behavior in question. By observing what others typically do, we get an idea of what is normal, believe that what we see is probably acceptable, and behave accordingly.

As social beings, we tend to give in to social influence and try to mimic what others do in order to fit in. When individuals feel compelled to conform to perceived social norms, they are under *normative social influence* (Deutsch & Gerald, 1955 as cited in Göckeritz et al., 2010). In this case, people follow the crowd because they are motivated by a desire to be socially accepted. This kind of incentive is usually associated with positive actions, such as recycling or conserving energy. When individuals believed or witnessed others engaging in such positive behaviors, they were more likely to engage in those behaviors as well (Göckeritz et al., 2010). However, it is a different story with negative actions, such as drunk driving or littering. Upon observing others engage in morally unacceptably behaviors, individuals would likely not be driven by a desire to conform with such norms or to belong to a group. Instead, their decisions to do as others do might be induced by a feeling of justification and confirmation of social acceptability.

The typicality of CPUWD (a negative behavior) might therefore rationalize the behavior, permitting drivers to use their phones while driving. It is normal, after all. For example, Hill et al. (2015) observed that 98% of their sample of college students testified to seeing other drivers

using their phones while driving. Furthermore, 81% said that they have been in cars where the drivers engaged in CPUWD. Students who witnessed others multitasking while driving were more inclined to exhibit the same behavior. Atchley, Hadlock, and Lane (2012) reinforced the effects of social norms on various risky driving behaviors. They provided participants with three accident scenarios: drunk driving, talking while driving, and texting while driving. They then informed them about corresponding laws and penalties. Afterwards, participants were asked to estimate the responsibilities of the drivers for the accidents and penalize them with fines and jail time. The researchers found that although participants attributed the most responsibility to texting drivers, drunk drivers were the most severely punished. This disparity indicates that awareness of the risk of CPUWD does not match the norms of the behavior (Atchley et al., 2012). Thus, the continuation of distracted driving problems, despite cognizance of the dangers, could be attributed to the social norms of CPUWD.

Furthermore, the prevalence of CPUWD behavior among close referents has shown to have an especially considerable effect on adolescent driving behavior. Although frequently witnessing other drivers (in general) does make CPUWD seem permissible, the behaviors of valued people undoubtedly are more salient. Carter et al. (2014) conducted a study on parental and peer injunctive and descriptive normative behavior. They found that perceived parent and peer distracted driving behavior were significant predictors of adolescent distracted driving behavior. Young drivers usually look up to their parents as role models, which implies that when the parents engage in a risky practice, adolescents are more likely to deem the behavior acceptable and less dangerous. This translates to greater adoption of CPUWD behavior. Additionally, prevalent cell phone use among peers also established a strong association with

adolescent CPUWD. The influence of peers will be discussed in detail in the section on group norms.

Göckeritz et al. (2010) suggest how injunctive normative beliefs might moderate the relationship between descriptive norms and behavior. They imply that perceptions of what others do will not solely influence execution of behavior. If injunctive norms, specifically of intimate referents, display approval of the target behavior, then the correlation between descriptive norms and behavior are expected to be stronger. This phenomenon has been observed in college students' drinking behavior (Lee, Geisner, Lewis, Neighbors, & Larimer, 2007). When students believed that their friends approved their drinking behavior, then there was a stronger positive relationship between one's perception of others' drinking behavior and one's own behavior. By the same token, perhaps an indication of approval of CPUWD might intensify the relationship between perceived prevalence of the behavior and an individual's involvement in CPUWD. When one frequently observes others using their phones while driving *and* believe that behavior is approved by others, then CPUWD might be more likely to occur. So far, there have not been studies explicitly examining the moderating effect of injunctive norms on the relationship between descriptive norms and CPUWD behavior. A further investigation into this interaction could warrant more insight into how both norms might collectively determine CPUWD.

C. Perceived Behavioral Control

Perceived behavioral control (PBC), the "perceived ease or difficulty of performing a behavior" (Ajzen, 1991, p. 188) is determined by control beliefs, which are the "perceived presence of factors that can influence a person's ability to perform a behavior" (Ajzen, 2015, p. 126; Montano & Kasprzyk, 2008, p. 71). If an individual perceives one's capability of executing

a given behavior to be great, then their intentions will be strong, and they will therefore engage in the behavior more frequently. On the other hand, if control beliefs about factors that may interfere with performance are strong, people will be less likely to exhibit the behavior. However, it is important to note that studies in distracted driving have generally measured PBC in terms of easiness of engaging in behavior, rather than by examining how control beliefs shape PBC. Those with greater PBC will be have higher intentions to engage in the behavior in question.

PBC is similar to illusion of control, but different in that it focuses on the behavior itself, whereas with the latter, control is ultimately extended to the outcome or occurrence of an event. That is, people under the illusion of control may think that they can control the probability of an event as they have sufficient mastery of what leads to that incident. On the other hand, PBC is the level of confidence one has in their ability to execute an action, which leads to more (or less) frequent performance. In studies, measures of PBC are framed as such: "In this situation, I believe that I have the ability to use a mobile phone" with a rating from *strongly disagree* to *strongly agree* (Zhou et al., 2009, p. 211) or "It is mostly up to me whether I will send[read] SMS messages while driving in the next week" (Nemme & White, 2010, p. 12). Positive evaluations of these measures generally lead to higher probabilities of performing the target behavior. As such, drivers who positively perceive their ability to use their phones driving might be more likely to intend to do so, therefore exhibiting more CPUWD behavior.

Research into PBC and distracted driving behavior has taken various routes – some have looked into different modes of phone use and some into types of phone use. Zhou and his colleagues (2009) noticed that PBC was a particularly important predictor of intention to use phones while driving. On average, young driving learners believed they had greater control over

phones, therefore indicated greater intention to use them phones while driving, whether hands-free or handheld. Similar findings were reported by Rowe et al. (2016), Chen et al. (2016), and Bazargan-Hejazi et al. (2017). Nemme and White (2010) subcategorized texting into sending and reading texts and found that drivers perceived greater control over sending texts, which was associated with greater intention to send texts. However, they were unable to find a strong correlation between PBC and reading intentions, nor between PBC and texting behaviors.

In addition, there were a few studies that did focus on control beliefs and their effects on CPUWD. For example, White et al. (2010) found that infrequent hands-free phone users were more likely than frequent users to be hindered by control factors (e.g. police or risk). Thus, perceived barriers significantly reduced the probability of being a frequent hands-free user while driving. As for hand-held phones, frequent users were more likely to believe that control factors would not deter their CPUWD behavior than were infrequent users. Control beliefs were found to diminish the likelihood of being a frequent hand-held device user while driving. Therefore, as observed in prior research, the more PBC one has, the more likely one is to engage in CPUWD behavior; the more they believe in the inhibitory effects of control beliefs, the less they would perform the behavior.

II. Non-subjective Norms

Although the original TPB model only comprises three components (attitude, subjective norms, and PBC), many succeeding researchers have considered moral and group norms as additional predictors of intention and behavior. Subjective norms, which will be explained in further detail soon, have had ranging effects, sometime weak, sometimes significant. Researchers acknowledge that especially among young people, social factors play a huge role in determining

behavior, thus they call for more investigation (Walsh & White, 2007). Since subjective norms have not proved to be entirely adequate, the inclusion of other factors within the social sphere is inevitable (Nemme & White, 2010). Therefore, this section examines group and moral norms in addition to subjective norms.

A. Moral Norms

Moral norms are personal perceptions of moral approval or obligations of performing a behavior (Ajzen, 1991). If individuals feel guilty about engaging in a certain behavior, they are more likely to refrain from performing it. Attaching a moral dimension might add more salience to the evaluation of behavior. Research has shown that moral norms contribute significantly to the variance in prediction of intentions (Ajzen, 1991). Therefore, it could be posited that the more ethically incorrect one thinks CPUWD is, the weaker their intention and the less likely they are to use their phones while driving.

Bazargan-Hejazi et al. (2017) found that moral norm (measured by guiltiness, acting against one's values, and wrong-doing) was a strong determinant of students' willingness to send and read texts while driving. When level of morality was high, willingness was lowered. Nemme and White (2010) also reported that moral norm significantly predicted texting while driving behavior, for both sending and reading texts. These studies support the negative influence of moral norms on CPUWD intention and behavior, where greater feelings of moral incorrectness about the behavior leads to a smaller likelihood of using phones while driving.

B. Group Norms

White, Hogg, and Terry (2002; as cited in Nemme & White, 2010) define group norms as "expectations (explicit or implicit) regarding one's attitudes and behaviors as a member of a specific reference group within a specific context." This type of norm seems to be especially influential in young people as they are responsive to social norms and desire to act according to what they view as socially acceptable. This behavior is driven by the want to belong to a group and to gain social identity. In order to secure their position in their group, young people therefore try to conform to perceived normative behaviors.

Group norms are similar to subjective norms in that they are both shaped by injunctive norms (approval of behavior) and descriptive norms (prevalence of behavior). However, the two are distinct in that the former pertains to a socially relevant group. In other words, subjective norms are derived from a broader, but still important, audience, whereas group norms are formed within a more well-defined circle. Moreover, according to the social identity theory, group norms are more prominent when people strongly identify with the group (Terry, Hogg, & White, 1999). Not only that, but group identity has also been found to be a moderator of the relationship between descriptive norms and behavior (Rimal & Real, 2005). Thus, individuals whose memberships are salient are more inclined to adopt the normative behavior (that are approved of and frequently engaged in) that they perceive within their circle.

Studies have shown that young adults distracted driving intentions are shaped by their reference group's attitudes and conduct. Carter et al. (2014) observed that adolescents who perceived distracted driving behavior to be prevalent among their peers (descriptive norms) *and* approved (injunctive norms) were more likely to also engage in the behavior. Similarly, Nemme & White (2010) found that the more an individual thinks their friends approve of texting while driving and frequently engage in the behavior, the greater their intention to also text while

driving. Therefore, group norms should be considered a significant motivation for people, especially younger drivers, to use their phones while driving.

III. Other Social Pressures

Other social factors that might encourage CPUWD driving behavior are related to the utility and necessity of phones in everyday lives. The social demands of cellular interaction may translate to more frequent use of phones regardless of situation, even when one is driving. The busyness of this society especially fosters social expectations to be prompt, responsive, and easily reachable either in person or electronically. Furthermore, technology has made information delivery extraordinarily fast, with computerized data whizzing around in mere fractions of seconds. Given these situations, people usually seem to be unforgiving about delayed feedback and expect immediate responses.

Studies have shown that due to such social expectations, even though drivers obviously realize the substantial risks associated with CPUWD, importance of contact, pressure, and perceived benefits of phone use far outweigh the risks, thereby urging people to use their phones in vehicle. For example, Atchley et al. (2011) suggest that drivers might experience social pressure to reply to a text, which compels them to use their phones even while driving. They argue that when the behavior is driven less by direct choice, such as initiating a text, people are less likely to be influenced by perceived risks and more by social obligation.

In addition, work life is imbued with important calls, which frequently demand to be swiftly answered. For example, Nelson et al. (2009) found that perceived importance of calls predicted the action of both initiating and answering calls, as well as prevalence of calls, thus often offsetting high awareness of risks of CPUWD. As for young people, social pressure to keep

in touch within the social network burdens them to stay connected at any time and at any place. The socially demanding culture might therefore push people to use their phones when they are driving. While it is impossible to eradicate such demands, perhaps as a society we need to find ways to dampen these pressures.

Conclusion

This chapter focused on the external factors that drive CPUWD behavior. It expounds on the Theory of Planned Behavior as a predictor of intention and behavior. According to this theory, attitude toward the behavior, subjective norms (shaped by injunctive norms and descriptive norms), and perceived behavior control each determine intention, which then influence behavior. Although TPB is not extrinsic per se, it is contained in this chapter because I put particular emphasis on subjective norm (a social construct, which was further broken down into injunctive norm (perceived approval or disapproval from important individuals) and descriptive norm (perceived prevalence of the behavior). The more approval people perceive and the more frequently drivers believe others engage in the behavior, the greater the tendency to use phones while driving.

Group norms and moral norms were also examined. People are especially driven by group norms because of strong desires to belong to a social circle. When individuals want to fit in a group, they feel pressured to comply with its normative behavior. Thus, if they think CPUWD is common, they will also feel "okay" to do the same.

Lastly, people might feel obligated to initiate or respond to texts or calls due to others' expectations. Nowadays people are expected to be easily reachable and are accustomed to instant

gratification – they need what they want (in this case, contact) immediately. These factors therefore contribute to decisions to use phones while driving.

The following chapter offers practical suggestions and interventions for inducing attitude and behavior change based on the risk of distracted driving, present laws regarding CPUWD, and individual and sociopsychological variables that may determine decisions to use phones while driving.

Chapter 5: Interventions to Counteract CPUWD

Introduction

In Chapter 2, I addressed the limitations of CPUWD laws in the US. Researchers have reported that texting prohibitions and hand-held phone restrictions have largely been ineffective, and short-lived at most. Furthermore, legislations are not necessarily the most effective way of preventing CPUWD (Oviedo-Trespalacios, King, Haque, & Washington, 2017). In order to compensate for these losses, there should be additional interventions and educational programs to tap into the psychology of choices to engage in CPUWD behavior. Former Secretary of Transportation Ray LaHood also emphasized the necessity of education and awareness programs on top of laws (LaHood, 2009 as cited in Steadman et al., 2014). Therefore, theory-based countermeasures and educational initiatives should be developed, in addition to laws, in order to induce attitudinal and behavioral changes in drivers who use their phones behind the wheel.

I. Implementation Intentions

Implementation intention is a widely used intervention to de-habituate negative habits and assist people in translating goals into action. As I have suggested in Chapter 3, habits of using phones are potential determinants of CPUWD. Furthermore, according to the Theory of Planned Behavior, intention predicts behavior. Implementation intention could therefore be utilized to overcome the effects of negative habits and ensure that intention to refrain from CPUWD can actually be translated into behavior.

Although people have good intentions, they often have trouble acting upon them. Prompting people to design a specific plan of action framed as “if-then” statements make the

opportunities to self-regulate more salient and noticeable (Armitage, 2016). Simply thinking "I will do X" is not sufficient nor motivating (Gollwitzer, 1999). People can continuously say "I will not use my phone while driving," but they do not necessarily behave according to their intention. Therefore, implementation intentions assist by linking a "critical" situation or condition to the intended behavior, which can then automatically trigger the behavior when the "if" cue is detected.

Studies have found that implementation intentions are effective in changing unhealthy behaviors and habits into healthy ones. For example, Armitage (2016) found that smoking habits have been mitigated by making participants form implementation intentions. The habitually smoking participants were asked to connect a certain situation (e.g. "When I am tempted to smoke when things are not going the way I want and I am frustrated") with an appropriate response (e.g. "then I will think about something else"). The results indicated that implementation intention did indeed diminish habits and smoking. Armitage (2016) adds that even when intention was shaped by questionnaires, there was a significant effect, meaning that urging people to form their own, personalized implementation intentions could be even more effective.

Similarly, alcohol consumption levels were reduced after an implementation intention intervention was employed. Hagger et al. (2012) conducted a study on Estonian and UK students to test the effectiveness of implementation intention on drinking. They found that the intervention led to a significant reduction in drinking for both nationalities and that binge-drinking frequencies significantly declined among the UK students at follow-up.

Snacking behaviors were also influenced by implementation intention. Adriaanse, Ridder, and de Wit (2009) tested the efficacy of implementation intention on changing unhealthy

snacking behavior and their findings supported the findings of previous studies. Participants were asked to create concrete plans according to personal situations in which they eat unhealthy snacks and by choosing healthier snacks to eat instead. Results revealed that personalized implementation intentions were successful in not only decreasing the negative behavior (eating unhealthy snacks), but also promoting a positive behavior (eating healthy snacks), therefore a behavior change.

These findings could definitely be applied to changing people's phone use habits. Even though many drivers know the dangers of CPUWD, understand that they should not, and have intentions not to use their phones while driving, they still engage in CPUWD behavior. However, they struggle to live out those intentions. Implementation intention is an extremely low-cost, simple, but effective method to bridge the gap between intention and behavior. If we can get drivers to construct a personalized and specific "if-then" plan, such as "if I start the engine, then I will put my phone in my bag," we might be able to see significant decreases in phone use while driving. Further research should be done to test this hypothesis.

II. Safety Messages and Campaigns

Efforts to prevent CPUWD behavior have frequently utilized safety campaigns and public service announcements (PSA), but the effects of the messages remain questionable. In order to fully address risky driving behaviors, improvements are required. In this section, I identify aspects campaigns could and should focus on: choosing a specific target audience, using more salient fear appeals, and applying theory. These are areas current programs seem to be lacking in, and if they are refined according to these suggestions, they might be able to substantially and effectively alter the CPUWD culture.

A. Target Audience

CPUWD behavior has been observed most among adolescent drivers because they believe they are immune to risks, are overconfident about their abilities, and lack sufficient driving experiences (Madden & Lenhart, 2009). However, preventive measures have not focused on young adults, but rather on a general audience. A content analysis of 250 YouTube distracted driving PSAs reported that teenagers were the intended audience for 29.57% of the messages, whereas the general public was the target audience for more than half (59.53%) of the videos (Steadman et al., 2014). The gap between the percentage of young adult CPUWD-related accidents and the proportion of PSAs aimed at adolescents should be bridged by directing campaigns toward this age group by tailoring messages according to specific characteristics of adolescents, such as greater inclination toward risk behaviors. Concentrating on the largest at-risk group might have a substantial effect on CPUWD behaviors (Hafetz, Jacobsohn, García-España, Curry, & Winston, 2010).

This does not mean that anti-distracted driving campaigners should cease targeting other age groups or the general public. However, given the great number of adolescents who use their phones while driving, focusing on a specific group might render interventions more efficient and effective. Furthermore, understanding the unique characteristics of adolescents might help in catering to the group, making the messages more impactful on a personal level. A number of other social marketing and public health campaigns benefited immensely by identifying a target audience. For example, the "Click It or Ticket" campaign aimed its ads toward 18-34-year-old males because they were the least likely to buckle up while driving (IIHS, 2009). Similarly, the "Don't Mess with Texas" anti-littering campaign also focused on 18-35-year-old males, after

research revealed that they littered the most (Social Impact Architects, 2016). The Texas Department of Transportation then was able to tailor to the target group, such as by casting typical Texan celebrities like Stevie Ray Vaughan and Matthew McConaughey, and developing a strong, aggressive, and macho-style slogan that would immediately catch the audience's attention.

If anti-CPUWD campaigns can also cater to the riskiest drivers (i.e. adolescents), then there might be noticeable results to a similar effect. Furthermore, it would be better to educate novice drivers earlier when their attitudes and mindsets are more malleable and CPUWD habits have yet to form. This way, we could prevent young people from becoming accustomed to using their phones while driving and encourage safe driving practices, and ultimately reduce accident rates associated with CPUWD.

B. Fear Appeals

Fear appeals are mostly used for discouraging unsafe activities, such as drunk driving and smoking. By appealing to emotion rather than reason, marketers and campaigners seek to achieve their intended goals. Emotionally charged messages often work better than informational appeals because they are more salient and leave a stronger impression on the receivers' minds. For example, in an anti-drunk driving campaign in New Zealand, a television advertisement of a graphic crash scene with a teenage driver who escaped the car but had to watch his friend burn to death was significantly associated with a decrease in drunk-driving rates (Tay, 1999). When people are induced with fear, they are triggered and adopt behaviors that mitigate the feeling of threat.

However, fear appeals have also engendered "boomerang effects," where people behave or intend do in the opposite direction (Lennon, Rentfro, & O'Leary, 2010). Teenagers in particular believe that they are not the targets for fear appeals or claim that they work on others but themselves. In addition, the increased exposure to violent and graphic materials may have made young adults immune to shocks. The mixed effects of fear appeals may be due to the low strength of the messages.

According to the Extended Parallel Process Model (EEPM), the effectiveness of fear appeals is determined by two factors: perceived threat and perceived efficacy (Witte, 1992). Perceived threat refers to severity of and susceptibility to the threat, and perceived efficacy refers to the ability to perform the target behavior. Witte posits that when threat and efficacy are perceived to be high, fear appeals work. However, when perceived threat is high but perceived efficacy is low, the appeal might have a boomerang effect. In order to assess the role of fear appeals, Lennon et al. (2010) examined how young adults evaluated existing fear-invoking distracted driving PSAs. The participants generally reported that the PSAs were not convincing or intense enough. The researchers suggest that future CPUWD PSAs should aim to strengthen fear appeals. Perhaps this could make messages resonate more with drivers, therefore prevent them from engaging in CPUWD behavior.

C. Application of the Theory of Planned Behavior

Theory-based interventions are crucial in promoting behavior change. They have had more success in changing behaviors than non-theory-based interventions (Webb, Joseph, Yardley, & Michie, 2010). Theory can shape interventions by pinpointing mechanisms and constructs that drive behaviors. Without understanding the underlying factors that prompt certain

actions (e.g. attitude), it would be difficult to develop measures that would effectively promote behavior change. Therefore, it is highly recommended that public health and traffic safety scholars start with the roots of CPUWD behavior in order to design strong interventions. In this section, I only discuss the Theory of Planned Behavior (TPB) as it was the main theory I utilized to explain CPUWD in Chapter 4.

The YouTube PSA study (Steadman et al., 2014) emphasized the necessity of incorporating behavior theories into the messages, as theory-based campaigns have been more effective in changing behaviors than those not grounded in theory. The researchers found that TPB constructs were not highly utilized in the videos, whereas more negative constructs of another model, the Health Behavior Model, were present in more than half of the videos. This pattern might be due to the tendency to focus on the risks and negative consequences of distracted driving. The researchers recommend that future PSA videos also try to incorporate other components of different theories, such as subjective norms. Further research should be done to examine the efficacy of theoretically grounded campaigns.

Webb et al. (2010) explored three types of theories (social cognitive theory, the transtheoretical model, and TPB), how they were integrated in Internet-based interventions, and the effectiveness of interventions on inducing health behavior change. They found that among the three, TPB had the largest effect, implying that it can be a promising framework for promoting behavior change, not just predicting behavior.

In the TPB, attitude, subjective norms, and PBC are posited to determine intention, which in turn affect behavior. Studies that have explained decisions to engage in CPUWD behavior using TPB focus heavily on shaping normative beliefs (injunctive and descriptive) in order to induce behavior change. In the following subsection, I will delve into how transforming social

norms, which I use as an umbrella term for subjective norms and group norms, can aid in changing attitudes and behaviors. I also include moral norms in this section because studies have strongly suggested that moral norms, along with group norms, should be extended constructs for TPB (see Chapter 4).

1. Social Norms

People tend to be conscious about what others think and do and look to others as references for behaving in certain ways. They are more likely to engage in activities that are approved by important others (injunctive norms), frequently observed among peers (descriptive norms), and perceived to be common especially within a specific reference group (group norms). Influencing social norms can have significant impacts on behavioral engagement.

Researchers have particularly emphasized the importance of approval – increasing the sense of disapproval from others, especially valued people, might discourage people from using their phones while driving (White et al., 2010; Atchley et al., 2012). Perkins, Haines, and Rice (2005) conducted a nationwide study on college students' drinking and warned that focusing solely on descriptive norms or information about actual drinking norms might be ineffective. Descriptive norms serve as a standard by which people evaluate how far they are from the norm. Thus, people tend to compensate for the gap by acting more or less depending on how below or above they perceive their behaviors to be from the average. This can be a problem for undesirable behaviors if people react in the opposite direction to descriptive norm information, such as increased drinking, as Perkins et al. (2005) found. Furthermore, for activities that are perceived with relatively less seriousness might be prone to such adverse phenomena. However, adding injunctive norms were found to be effective in diminishing the boomerang effect

(Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007). In their study, Schultz et al. (2007) observed that households that originally exhibited low energy consumption increased their usage when provided with information about the actual average energy consumption per household, which was an undesirable effect. However, those households with below-average energy consumption that also received injunctive messages about their usage did not deviate from their initial rates. In addition, the researchers found long-term effects for four weeks, implying the potential for this type of intervention. Thus, integrating both descriptive and injunctive norms might have a synergistic effect on inducing a positive CPUWD behavioral change.

Norms can be even more impactful within an intimate, relatable group. In addition, the social influence of groups is especially powerful among young adults – they frequently look to their circle and try to fit in. Given these circumstances, interventions that change social norms within groups might potentially reduce misperceptions and change behavior. For example, Bazargan-Hejazi et al. (2017) suggested that altering misperceptions about the prevalence of texting while driving behavior among peers and getting group members to actively and explicitly display disapproval could help promote conversion to safer driving habits. Injunctive and descriptive norms also apply to the group context. Nemme and White (2010) suggested that in order to minimize antagonistic effects of group norms, it is important to decrease the perceived prevalence of texting among young people and by strengthening the belief that peers would not favor texting while driving.

Overall, changing the social norm of CPUWD so people feel greater disapproval from others (especially valued ones or close groups) would be greatly beneficial in changing behavior. Practically, governments or organizations could set up social norming programs to make drivers aware of the actual norms. For example, Elder et al. (2005) examined two social norming

programs for drunk driving and found them to be effective in reducing alcohol consumption among those who participated in the program. Although the small sample size poses a limitation, the result nonetheless has hopeful implications that correcting social norms could elicit behavior changes.

2. Moral Norms

In addition to social norms, moral norms have also emerged as a strong predictor of intention to use phones while driving. The more guilt or ethical obligations one perceives about the behavior in question, the less one is to engage in that behavior. Interventions and social marketing messages should therefore incorporate moral dimensions in combatting CPUWD behavior. When drivers are prompted to understand the moral incorrectness, not merely social acceptability or legalities, of CPUWD, they might be more inclined to refrain from engaging in that behavior.

Moral norms should be emphasized by making people feel guilty about their behaviors. One way to do this is to stress one's responsibility not only to self but also to others (Nemme & White, 2010). Much of the risk perception research focuses on individual risk, but not on risk posed to other people due to an individual's faulty decision making. This fosters a sense of invincibility within individuals, while there is little attention on how CPUWD can endanger others, whether they be passengers, other drivers, or pedestrians. When drivers feel accountable for other people's lives, they might feel more guilt and remorse, which could discourage them from using their phones while driving.

In designing successful interventions, we can look to anti-drunk driving campaigns as a model. Prior to the 1980s when Mothers Against Drunk Driving (MADD) rose up, drunk driving

did not receive much spotlight regarding its dangers. However, over the decades, many people have come to view it as morally wrong, shameful, and horrible. Part of the success of anti-drunk driving campaigns can be attributed to efforts to integrate moral concerns. For example, the Department of the Environment Northern Ireland (n.d.; as cited in Benson, McLaughlin, & Giles, 2015) associated guilt and shame with intoxicated driving. Their campaign, after five years, resulted in 93% of Northern Irish considering drunk driving a shameful act, as well as a surprising but encouraging 79% decrease in number of deaths by intoxicated drivers. We can also see the enormous immorality recognized with drunk driving in Terry and Terry's (2016) study. By comparing people's perceptions of CPUWD and of driving under the influence (DUI), they suggested that people might not regard CPUWD with the same moral standards as they do drunk driving. While DUI is associated with great stigma, CPUWD may appear relatively normal and not as morally problematic. Therefore, if we are to see reductions in CPUWD, interventions need to attach a more stringent moral norm to the behavior just as MADD have rigorously campaigned to stress the moral incorrectness of drunk driving.

3. Attitude Changes – Emphasize Benefits, Not Risks

In promoting behavior change, persuading people to change their attitudes about the behavior is imperative. TPB studies have seen that attitudes tend to be the strongest predictor of intentions, which implies that altering attitudes could translate into considerable changes in behavior (Nemme & White, 2010). Interventions could change attitudes in two ways: by highlighting the benefits of *not* using a phone while driving or by stressing the dangers of CPUWD.

According to Hafetz et al. (2010), intervention programs might be effective when the benefits of self-regulating CPUWD are emphasized, as they have been associated with lower levels of engaging in the behavior. The researchers found that perceived advantages of abstaining from CPUWD were linked to lower rates of use, whereas perceived disadvantages were linked to more prevalent use. Framing CPUWD in terms of gains had more positive effects on frequencies of CPUWD behavior than framing in terms of losses. Benefits of limiting cell phone use included lower likelihood of getting into accidents, satisfying parents, and driving legally. Disadvantages included deviating from norms, looking less social, and fear about friends' perceptions. Hafetz et al. (2010) suggest that adolescent CPUWD behavior might be effectively reduced by positively framing the advocated behavior and emphasizing the safety aspects. Furthermore, perceived advantages would encourage and make drivers feel better about *not* using their phones while driving.

The other method of changing attitude is by underscoring the severity and dangers of the problematic behavior (Terry & Terry, 2016). In the previous paragraph, a positive attitude is formed about *inhibiting* CPUWD, which is the target behavior. On the other hand, with the second type of intervention, a *negative* attitude toward CPUWD is induced so that one would intend to avoid the behavior. If campaigners can help individuals recognize how bad and severely risky CPUWD is, they might be able to promote behavior change by making people want to stop using their phones while driving.

III. Education

Education programs for CPUWD prevention are generally underdeveloped. This lack of programs contributes to the ongoing prevalence of CPUWD behaviors despite the increased

number of anti-distracted driving campaigns. Scholars, time and time again, have adamantly suggested that the public needs to be better-educated to reverse the CPUWD trend as laws and campaigns alone have not sufficed.

Currently, in the state of Texas, applicants for driver licenses are required to complete the Impact Texas Drivers (ITD) program, in which they watch an informational video outlining the dangers of distracted driving and contains interviews of those impacted by distracted driving (Texas DPS, n.d.). Although this initiative is certainly a step in the right direction, merely informational, one-way interventions may have little effect on people's awareness or attitudes. For example, Elder et al.'s review of school-based programs reported that most of curriculums incorporated interactive activities, which have turned out to be effective conveyance mechanisms.

Furthermore, education programs should not only be developed by governments, public health professionals, and traffic safety experts, but also by schools and communities that can easily reach out to a wider audience. When schools and communities actively participate, awareness can spread more extensively, especially to younger students who may not usually have as much access to information as do older people. Ensuring that even pre-licensed individuals are also properly taught the dangers of CPUWD is might lead to a lower inclination to engage in the behavior.

School-based education programs have experienced some success in encouraging adoption of safety measures and avoidance of risky behaviors. For example, the You Hold the Key (YHTK) program developed in Ohio witnessed increases in a number of safe driving practices, such as seatbelt use (King, Vidourek, Love, Wegley, & Alles-White, 2008). A follow-up after six months even revealed that effects lasted – students reported a continuation of

engaging in safety behaviors. In addition, the program endeavored to provide information, form positive attitudes about safety behaviors, and cultivate driving skills, as opposed to orthodox, solely knowledge-focused programs. The researchers recommend that schools should develop comprehensive programs that cover an array of components that impact behavior, from knowledge to skills.

Elder et al. (2005) further suggest that communities also be included in school-based programs in order to augment their effectiveness. Unni, Morrow, and Shultz (2013) developed a hospital-school intervention, titled Be in the Zone (BITZ), in which student leaders were chosen to attend a driving safety education program in a hospital (Phase 1) and led a peer anti-texting campaign while driving at their schools (Phase 2). The researchers found a significant decrease in self-reported texting while driving incidents after Phase 1, and another significant reduction from pre-Phase 2 observed drivers texting while driving to post-phrase observations. The pilot program owes its success largely to its interactive nature and high involvement of communities, both of which were mentioned by other researchers to be essential in maximizing the benefits of school-based interventions.

Overall, education programs need further development at this point. However, they have promising futures for CPUWD behavioral change. School-based interventions in particular appear to hold enormous benefits in many ways. First, they can reach a large number of adolescents at once (Buckley, Chapman, & Sheehan, 2014). This also means that the curriculum can be tailored to meet the specific needs of teenagers since the target audience is identified. Moreover, educating potential drivers at an early age, even before the obtain their licenses, might be able to instill a positive attitude toward safety behavior without having to struggle to convert attitudes later when the favorably view CPUWD. Given the advantages and reported successes of

school-based education programs, governments could even consider making CPUWD curriculums at schools mandatory, if not fund schools to implement programs. This would not only guarantee that more people are aware about the risks of CPUWD, but also establish the severity of the issue that many individuals seem to be ignorant of. It is crucial, therefore, to thoroughly educate people so that they internalize the risks of CPUWD and adopt positive safety attitudes and habits, which could ultimately prevent drivers from using their phones while driving.

IV. Law Enforcement and Modifications

Laws against phone use while driving vary by state and in terms of the extent of the ban (texting or hand-held), the level of enforcement (primary or secondary), strength of penalty, and a multitude of other components. However, as seen in Chapter 2, traffic safety has not substantially reaped the benefits of legislations. Scholars and experts have voiced concerns about the fruitlessness of the bans, suggesting that more stringent and forceful measures should be taken to ensure that legislations bring down the rate of CPUWD.

One area of improvement is the degree of enforcement. Currently, there are more states that primarily enforce texting bans than those applying secondary enforcement (GHSA, 2018). For all-phone restrictions targeting novice drivers, primary enforcements predominate across the nation. It would be best and ideal, however, if more states make anti-texting or anti-phone legislations a priority by making the offense ticket-able itself. This would not only stress the seriousness of the behavior, but also make it easier for officers to cite drivers for violations. With secondary laws, even when officers stall drivers for disobeying the law, they are not permitted to penalize them unless other offenses have been made previously. Furthermore, there have been

abundant evidence suggesting that primary enforcements indeed result in a decline in traffic offenses (Rocco & Sampaio, 2016; Dinh-Zarr et al., 2001). Road safety would increase if people realize the true dangers of CPUWD and accordingly create or update their current bans to be primarily enforced.

Another preventative measure is to prohibit the use of hand-held phones altogether, instead of one specific behavior (i.e. texting). Detecting texting drivers proves to be extremely tricky, especially because messaging is almost indistinguishable from other uses that manifest in physical manipulations of phones, such as setting up a GPS or scrolling through a playlist. In addition, only proscribing texting behavior could give drivers the wrong impression that other CPUWD behaviors are safe and acceptable. Banning hand-held use entirely would ease enforcement, ingrain in people's minds that any CPUWD is dangerous (and not just texting) is dangerous, and consequently will probably be more effective in hindering CPUWD, as have been seen by reduced accident rates (Nikolaev et al., 2010; Kwon et al., 2014).

Along the same lines, legislations should apply to all drivers, not just school bus drivers or teenagers. Indeed, school bus drivers and young people should take extra caution because of the greater risk and impact their driving entails, but this should not exempt all other motorists from being subject to the same restrictions. Rudisill and Zhu (2017) analyzed observed CPUWD following the enactment of hand-held phone restrictions on all drivers and found that such laws were correlated with fewer incidents of hand-held phone conversations. Universal hand-held bans are therefore essential in making more drivers at least remotely aware that CPUWD should be avoided at all costs.

Lastly, there is an urgent need for stricter enforcements. A major, yet-to-be-solved puzzle in the legislation is the issue of *how* to practically apply the laws. Up until now, the increasing

number and intensity of bans have not been duly backed up by matching strengths of enforcements. Detecting texting law violations, and even hand-held phone usage, require highly attentive observations on part of the officers. However, there have been limitations in enforcements, rendering the laws somewhat weak. One way to address this problem is to implement high-visibility enforcement (HVE), which "combines dedicated law enforcement during a specified period, paid and earned media that emphasizes and enforcement-based message, and evaluation before and after" (Cosgrove, Chaudhary, & Reagan, 2011). In other words, exposing and publicizing the law to the public might yield significant results. In the past, HVE has succeeded in other road safety campaigns, such as "Click It or Ticket," DUI, and speeding (Cosgrove et al., 2011). It works by making drivers fearful of penalties if they are caught. In order to avoid getting tickets, in the presence of intense enforcements and officers, drivers would be prompted to put down their phones, as seen in Connecticut and New York (Cosgrove et al., 2010). In light of these successes, periodic HVE enforcements should be adopted to make drivers more aware of the law. Of course, legislations and enforcements alone will not do – education programs and PSAs should be utilized side by side in order to delve deeper into people's perceptions about the behavior itself, not just about the getting cited. This way, even during non-HVE periods, drivers would be less inclined to engage in CPUWD behavior.

V. Involvement of Related Industries

CPUWD problems should not be an assignment only for governments, public health specialists, or officers. Telecommunication, phone, insurance, and automobile companies, all who have a stake in this issue should also participate in tackling this matter. Actually, AT&T,

one of the leading telecommunications corporations in the nation, has actively advocated CPUWD countermeasures. They launched their own campaign, named "It Can Wait," through which they voice their opposition to distracted driving, encourage individuals to take the pledge not to use their phones while driving, and provide information and resources to learn more about the dangers of CPUWD. They offer virtual reality (VR) tours in cities so individuals can get a first-hand experience of distracted driving and they designed a phone application, "AT&T DriveMode" to help avoid CPUWD (AT&T, n.d.). Certainly AT&T is an excellent model for combatting CPUWD, but it should not be a lonely soldier. If other related industries commit to the campaign, whether it be raising insurance rates for those responsible for CPUWD-related accidents or developing various technology to minimize cell phone use, drivers would feel more pressure from various sources, but also more assistance to cease using their phones while driving. The feasibility of firm involvement has yet to be determined, but traffic safety would definitely benefit from more extensive campaigns.

Conclusion

This chapter emphasized the need for theory-integrated interventions, education programs, enforcements, and technological advancements to tackle the issue of CPUWD and persuade the public to disengage from the behavior. Despite the proliferation of anti-CPUWD campaigns, cell phone use rates and accident rates have not been significantly impacted. In order to make PSAs and safety messages more effective, a specific target audience must be identified, fear appeals (if used) should be intensified, and messages need to be firmly grounded in theory. In addition, education programs are imperative in enforcing public awareness and forming or changing attitudes toward distracted driving. If governments, experts, and campaigners improve

their programs based on these suggestions, countermeasures might become more successful in reducing CPUWD behavior. Strengthened law enforcements, implementation of all-inclusive bans, and involvement of industries associated with cell phones or automobiles would also be contribute. However, additional research must be done to contemplate other interventions that could help reduce CPUWD.

Chapter 6: Discussion and Future Research

This thesis explored the current state of cell phone use while driving (CPUWD) by examining the statistics of CPUWD-related accidents, observed cell phone use, and the specific dangers of texting and calling in particular. In the past decade, rates of cell phone use and accidents have remained relatively stable, with no significant declines. The advancement of cellular technology and exponential growth in the number of smartphone users have contributed immensely to the lack of positive change. Furthermore, weak enforcements have rendered texting and hand-held phone bans ineffective, despite the widespread enactments across the nation.

In order to address this alarming reality, this thesis studied the psychological and situational variables that determine engagement in CPUWD behavior. Intrinsically, drivers are prone to cognitive biases that negatively affect risk perceptions. Their evaluations of the probabilities of getting involved in an accident due to their distracted driving are strikingly positive, justifying their phone use behind the wheel. Furthermore, habits and attachments cultivated by extremely frequent phone use, along with desires to stay connected to the world cause users to cling to their phones regardless of situation. Over-occupation with phones easily replace the primary task of driving, having serious ramifications.

Extrinsically, norms shape how people perceive behaviors, and therefore willingness to engage in them. Individuals will use their phones while driving, however cognizant of the risks people are, if they believe it is socially acceptable or normative. In addition, social pressure to stay connected and reachable by a simple call or text may also be a motivational factor.

With these mechanisms in view, I suggested practical interventions to prevent CPUWD behavior or to induce attitude, and ultimately behavior change. First and foremost, countermeasures should be grounded in behavior theories and psychological constructs, such as the Theory of Planned Behavior and implementation intentions. A large portion of PSAs do not utilize theories, which could possible explain their lack of success. Moreover, campaigns and safety messages should aim to target young adults and use emotional appeals. Furthermore, governments should actively employ high visibility enforcement to raise public awareness on CPUWD risks *and* on the legislations. Officials and public health specialists should run test trials to see if these measures are effective in reducing the behavior. There should also be rigorously structured, interactive educational programs that would teach pre-drivers and novice drivers, especially, that CPUWD is just as threatening to public health and road safety as other notorious behaviors, such as smoking or drunk driving. I would even recommend that such a program be mandatory or integrated into school curriculum. In addition, if related industries could also participate in advocating anti-CPUWD, it might further contribute to creating a safer driving environment.

It is crucial to keep in mind, however, that the recommendations I make are by no means exhaustive, and that further research could generate better ideas to combat CPUWD. In the present thesis I only focused on the implementation intentions and the Theory of Planned Behavior because it has been used most frequently to explain and predict CPUWD behavior, so I thought it could be also used to reverse the behavior by promoting an anti-CPUWD activity. However, there are other important behavior theories and concepts not mentioned in this thesis but are also widely used to change negative behaviors, such as the transtheoretical model and the nudging theory, which should certainly be studied as well.

Overall, I emphasize the importance of theories in analyzing distracted driving behavior because in essence, the roots of CPUWD behavior are grounded in psychology. In other words, understanding the psychological foundation and applying relevant theories through interventions would have greater potential to solve this CPUWD problem than mere superficial measures like regulations, although still crucial. Therefore, future research should further examine psychological variables that determine CPUWD behavior and seek to develop countermeasures that take those factors into account, as I have attempted in this thesis. Perhaps, this would result in greater reductions in CPUWD prevalence and accident rates.

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Biography

Sojung Lee was born in Seoul, South Korea, on September 27th, 1995. She grew up in Austin, Texas since the age of 3, but has gone back to Seoul for 4.5 years and returned to Austin prior to going to high school.

She enrolled in the Plan II Honors Program at the University of Texas at Austin in 2014. In 2018, she will be graduating with a B.A. in Plan II and Psychology, as well as a minor in Chinese and a certificate in the Business Foundations Program.

Upon graduating, she plans on traveling in Asia and in Europe during the summer while she contemplates graduate school.