YOUNG DRIVER EMOTIONS RELATE TO THEIR INTENTION TO ENGAGE IN CELLPHONE DISTRACTION

Mehdi Hoseinzadeh Nooshabadi, Holland Vasquez, Birsen Donmez
University of Toronto, Toronto, Ontario, Canada

Young drivers' disproportionate involvement in road crashes due to cellphone distractions calls for remedial programs. Development of such programs requires an understanding of the reasons behind engagement in distractions and identifying factors to leverage, such as emotions. This investigation sought to determine how young drivers' intention to engage in cellphone distractions is associated with negative emotions. An online survey was administered to 99 young drivers (18 to 25). Participants rated their intention to engage in cellphone distractions while driving and their anticipation of negative emotions while doing so. Our results showed an association between anticipating negative emotions and the intention to engage in cellphone distractions while driving. There was no difference between males and females in their reported intention. However, females reported greater anticipation of negative emotions compared to males. These findings have implications for emotion-based manipulations aimed at reducing distracted driving among young drivers.

INTRODUCTION

Road crashes are the leading cause of death for children and young adults between 5 and 29 years of age (WHO, 2018). Compared to other age groups, young drivers are overrepresented in fatalities and injuries due to car crashes, accounting for 29% of driver fatalities in the United States (US) in 2018 (National Center for Statistics and Analysis, 2020). Distractions, including cellphone use, add to the driver's visual and cognitive demand (Klauer et al., 2014; Simons-Morton et al., 2011), and have been identified as major contributing factors in crashes and fatalities (NHTSA, 2019). In 2018, distraction accounted for 5% of driver fatalities for all age groups in the US; and was associated with 6.2% of fatalities for drivers 29 years of age and younger (National Center for Statistics and Analysis, 2020). In fact, this age group constituted 34% of driver fatalities in car crashes, with nearly half attributed to cellphone distractions (National Center for Statistics and Analysis, 2020). Considering that this age-group accounted for 20.4% of all licensed drivers in the US in 2018 (Office of Highway Policy Information, 2020), the aforementioned statistics highlight the disproportionate involvement of younger drivers in crashes and fatalities. Younger drivers use their cellphone more frequently compared to older drivers, with cellphone use highest among drivers 16-24 years of age (National Center for Statistics and Analysis, 2019). Accordingly, there is a need to develop remedial programs and countermeasures to reduce distracted driving, specifically among young drivers.

The differences between younger and older drivers' involvement in distractions while driving may be partially attributed to emotional development that young drivers experience as a function of their age. Emotions are defined as "complex reaction patterns, involving experiential, behavioral, and physiological elements, by which an individual attempts to deal with a personally significant matter or event" (VandenBos, 2015). In general, emotions operate as information processing systems which help individuals in dealing with a certain set of person-environment relationships (Dillard & Peck, 2001) and limit the number of possible alternative responses, accelerating the decision-making process (Damásio, 1995). According to Izard et al (1993), emotions can be divided into 12 distinct types, namely interest, enjoyment, surprise, sadness, anger, disgust, contempt, fear, guilt, shame, shyness, and hostility.

Young individuals are more likely to experience strong emotions than older individuals (Scott-Parker, 2017). This may in turn affect their driving behavior. For instance, risk taking while driving is associated with young drivers' emotions. Eherenfreund-Hager et al. (2017) primed participants with different sets of words that had been previously found to arouse positive or negative emotions. After being primed, participants completed a set of drives in a driving simulator and their performance was assessed. While results demonstrated that the arousal of positive and negative emotions was related to drivers' risk-taking behaviour, it is important to note that the emotional manipulation used was not related to driving context and the consequences of risky driving behaviors.

In general, little is known about whether emotional manipulations can be used to leverage young drivers' emotions related to distracted driving and as a result, reduce their engagement in distractions while driving. To this end, it is imperative to first evaluate the association between emotions and intention to engage in distracted driving. Brown et al. (2019) conducted a survey study among young drivers in Australia. Their work is one of the few studies that has examined the relationship between emotions and driver intention to engage in texting while driving. They used the Theory of Planned Behavior (TPB; Ajzen, 1991), which suggests that human behavior is a function of intention, which itself is influenced by attitudes, subjective norms, and perceived control over the behavior. Brown et al. (2019) focused on one particular emotion, regret, and their results showed that the more a driver anticipated feeling regretful for texting while driving, the less s/he reported to intend to engage in it. This suggests that other emotions may also be associated with driver intention to engage in cellphone distractions, which is investigated in the present study.

The effectiveness of emotional manipulations targeting young individuals may depend on which emotions are being targeted. Emotional manipulations have generally consisted of

physical and social threats, which are intended to elicit the emotions of fear, shame, and guilt (Becheur & Valette-Florence, 2014). For example, health communication programs have widely used fear-based persuasion to change behavior within the population (Soames Job, 1988). However, for young individuals, fear-based appeals may not be as effective as communicating social threats (Pechmann et al., 2003). For instance, Peckmann and colleagues examined the effectiveness of anti-smoking messages with adolescents. Their results showed that only messages that communicated social threats were effective in young individuals. Communicating social threats (e.g., threat of losing respect of others), usually evoke the emotions of shame, guilt, and sadness to convince people not to engage in an action (Rossiter & Percy, 1987). Such threats have been shown to be more effective for younger individuals compared to older individuals (I. M. Lewis, Watson, White, & Tay, 2007; Schoenbachler & Whittler, 1996). In their review, Schoenbachler and Whittler (1996) provide examples of how social threats (e.g., threat of losing license and the social stigma attached to license loss) may be an effective threat appeal, particularly for younger individuals. These findings suggest that emotions other than regret (i.e., shame, guilt, and fear) may also be associated with driver intention to engage in cellphone distractions.

Additionally, the effectiveness of emotional manipulations may vary by sex (Lewis, Watson, White, et al., 2007; Quinn et al., 1992). For example, Lewis et al (2007) reported that threat messages in the context of drunk driving and speeding were more effective with females than males. However, in the context of driving, there is no consensus on whether there are differences in males and females in terms of distraction engagement. Some research has suggested that females are more likely to report engaging in cellphone distractions (e.g., Sullivan et al., 2021), while other studies have shown the opposite (Barr et al., 2015) or have found no difference (e.g., Bazargan-Hejazi et al., 2017). As such, the relationship between intention to engage in cellphone distractions and resulting emotions for doing so, may depend on sex.

The present investigation examined the relationship between young drivers' anticipated negative emotions and their intention to engage in cellphone distractions while driving. It serves as a first step towards understanding whether emotional manipulations can be leveraged to reduce distracted driving among young drivers. An online survey study was conducted with young drivers in Ontario, Canada. We focused on a set of risky visual or manual interactions with cellphones, as they can compromise drivers' attention or their control over driving. All such distractions are recognized as illegal behaviors, according to Ontario regulations. Accordingly, we limited the scope of emotions analyzed to a set of negative emotions, namely, guilt, shame, and fear.

Participants were asked to report their intention to engage in a variety of cellphone related distractions and the degree to which they would anticipate experiencing guilt, shame, and fear for doing so. There were three primary hypotheses:

H1. As drivers' anticipation of feeling guilt, shame, or fear due to engaging in cellphone distractions increases, their intention to engage in such distractions would decrease.

H2. Intention to engage in cellphone distractions may depend on sex.

H3. Females would report anticipating higher negative emotions toward cellphone distractions than males.

METHODS

Data were collected from 99 participants (65% Female; 18-to 25-year-old, mean age = 20.1 years, SD age= 1.9 years) during the months of August and September 2020. Participants consisted of young drivers from Ontario, Canada. To be eligible, participants had to be between 18 and 25 years of age. They had to report having a valid Ontario driver's license of G2 or G (drivers with Ontario learner's permit, G1, were excluded as they cannot drive alone and have certain restrictions as to which roads they can drive on). Additionally, participants had to report driving at least a few times a month. Participants were recruited through online advertisements on social media, colleges, universities, and community centers across Ontario, and the survey was hosted on the SurveyGizmo platform. The study was approved by the Research Ethics Board at the University of Toronto (protocol #39534).

Survey Constructs and Measurements

The data were collected as part of a larger survey, designed to study the role of emotion-based manipulations targeting cell-phone distractions of young drivers. The larger study investigated a variety of driver behaviors and beliefs about engagement in distractions while driving. In this paper, we report an analysis on participant responses to questions related to: 1) their intention to engage in cellphone distractions and 2) anticipated emotions that may result from engaging in cellphone distractions.

Participants were informed that the purpose of the study was to investigate potential reasons behind young drivers' engagement in cellphone distractions while driving and provided consent to participate. They then responded to a series of basic demographic questions including their age, sex, and driving experience. To minimize the effects of the COVID-19 restrictions and to collect regular driving behavior data, participants were asked to consider their driving in 2019, prior to the pandemic. Participants were then asked to respond to the intention to engage and the anticipated emotions questions detailed below.

Intention to engage in cellphone distractions. Participants were presented with images of an urban driving environment (Figure 1) and were asked to report their intention to engage in a series of cellphone distractions over the next year while imagining no COVID-related restrictions. The urban setting was chosen over a rural one as drivers and vulnerable road users interact to a greater extent in urban environments. Table 1 provides the list of cellphone distractions that participants were asked to consider. Intention to engage was assessed

through the following two questions; responses were indicated on a 5-point Likert Scale with 1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = very often.

- "Over the next 1-year period, **how often do you intend to engage** in each of the following tasks [Table 1 items] while driving in a scenario similar to the ones illustrated in [Figure 1]?"
- "Over the next 1-year period, **how often do you feel it is likely that you will engage** in each of the following tasks [Table 1 items] while driving in a scenario similar to the ones illustrated in [Figure 1]?"

Table 1. Cellphone Distractions Surveyed

1.	Talking to someone e.g., phone call, Facebook audio, WhatsApp, etc. on a hand-held cellphone
2.	Reading or responding to a text message through manually interacting with a phone (not through voice interface)
3.	Manually checking or updating social media, such as Facebook, Twitter, or Instagram (not through voice interface)
4.	Searching for a song/artist/album/playlist on a music app in your cellphone (not through voice interface)
5.	Manually entering an address into a navigation app on a smartphone or built-in or mounted navigational system while driving (not through voice interface)

Figure 1. Images provided to the participants to represent the urban driving context

Anticipated Emotions. Participants were asked to report the degree to which they agreed with the following statements related to emotions that may result from engaging in cellphone distractions. "For me, manually interacting with my cellphone while driving in an environment like the illustrated images [Figure 1] would be something I would feel:

- guilty doing
- ashamed doing
- scared doing."

Responses were indicated on a 7-point Likert Scale with 1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = neither disagree nor agree, 5 = somewhat agree, 6 = agree, and 7 = strongly agree.

ANALYSES AND RESULTS

The intention construct was a composite score based on the average of the responses across the intention items and different cellphone distractions, and was internally reliable (Cronbach's α=.93). Measures of anticipated emotions were collected through single items. All data were processed and analyzed in RStudio v.1.1.456. Given that our emotion items were categorical and normality assumptions did not hold, Spearman correlation was used to determine the association among the three negative emotions, and between each negative emotion and average intention. Wilcoxon signed rank test was used to compare anticipated emotions of guilt, shame, and fear. Independent t-test was used to compare females and males in terms of their average intention, and Wilcoxon rank sum was performed to compare them in terms of the emotions. Regression models were created to evaluate the extent to which emotions and sex can predict intention to engage in cellphone distractions while driving.

H1: Relationship between Intention and Emotions

Overall, average intention across all cellphone distractions was 1.81 (SD=0.63), corresponding closest to "rarely." Average guilt was 5.43 (SD = 1.39), average shame was 4.67 (SD = 1.72) and average fear was 4.94 (SD = 1.75), all corresponding closest to "somewhat agree." Guilt, shame, and fear were positively correlated with each other. Spearman correlations between emotion pairs were as follows: for guilt and shame ρ=0.80, for guilt and fear ρ=0.60, and for shame and fear ρ=0.65 (all were significant with p<.0001).

Wilcoxon signed rank tests showed that participants reported a greater anticipation of guilt than shame (V=1447, p<.0001), a greater anticipation of guilt than fear (V=1470, p=.003), and a marginally greater anticipation of shame than fear (V=725.5, p=.07). Furthermore, guilt, shame, and fear were negatively correlated with average intention. Spearman coefficients between guilt, shame, and fear and average intention were -0.48, -0.47, and -0.50, respectively (all were significant with p<.0001).

H2 & H3: The Effect of Sex on Intention and Emotion

Participants who chose not to indicate their sex were excluded from the analysis (N_{Female}= 65 and N_{male}=30). An independent t-test was used to determine whether there are differences between female and male participants in terms of average intention, and Wilcoxon rank sum was used to compare them in terms of the negative emotions for cellphone distractions. There was no significant difference between the intentions reported by our female and male participants (p=.81). However, compared to male participants, female participants reported higher responses for guilt (W=1218, p=.04), shame (W=1217, p=.049), and fear (W=1339, p = .003). Figure 2 presents the boxplots of emotions and average intention for female and male participants, along with the results of Wilcoxon rank sum tests as well as correlation coefficients between the emotion items and average intention.

Spearman Rank Correlation between emotions and average intention were generally similar for both female and

male participants, with one exception: for female participants, average intention was negatively correlated with all three emotions. However, for male participants, average intention was negatively correlated only with guilt and fear, and the correlation between males' average intention and shame approached significance (p=.08).

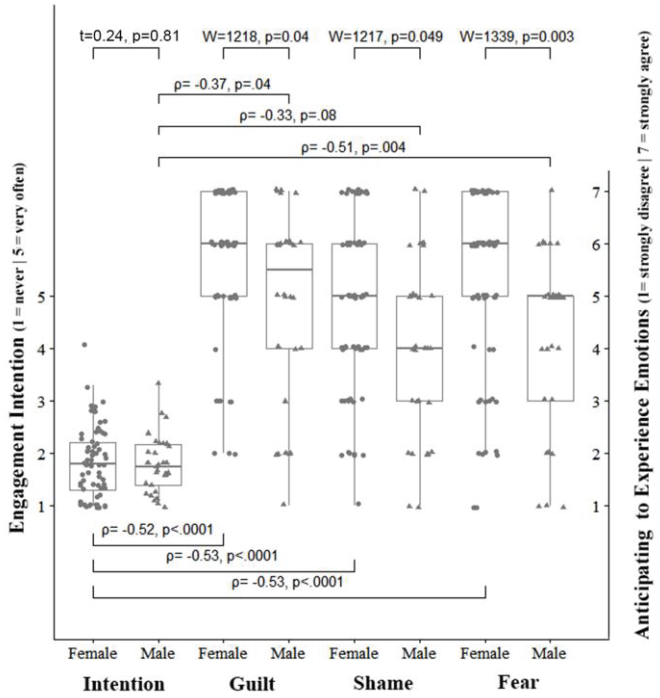

Figure 2. Boxplots of average intention and emotions for female and male participants. Results of independent t-test and Wilcoxon rank sum test to compare female and male participants are reported on top. ρ represents Spearman's correlation coefficient between average intention and emotions; female results are reported at the bottom and male results at the top.

To further explore the effect of sex on the relationship between emotions and average intention, separate regression models were built with each emotion item, sex (female or male), and the interaction term between the two as the predictor variables, and the average intention as the dependent variable. The three models were significant and in each, anticipating feeling guilt, shame, and fear negatively predicted average intention to engage in cellphone distractions while driving (p<.0005). The R-squared values corroborated the correlation results and suggested that the model for fear could explain the highest variability (R^2=0.26) of average intention compared to the model for guilt (R^2=0.15) and the model for shame (R^2=0.20). Sex and the interaction terms were not significant in any of the three models (p>.05).

DISCUSSION

This study examined the relationship between anticipated negative emotions and intention to engage in cellphone distractions while driving. We had three hypotheses. The first hypothesis was that there would be a negative association between anticipated guilt, shame, and fear and the intention to engage in cell phone distractions. The second hypothesis was that female participants would report lower average intention to engage in cellphone distractions while driving, compared to male participants. The third hypothesis was that females would report anticipating more negative emotions when engaging in cellphone distractions than males.

Our results supported our first hypothesis. There was a negative association between anticipating feelings of guilt, shame, and fear for engaging in cellphone distractions while driving, and the intention to do so. Participants reported higher responses for guilt than shame, and they anticipated the feeling of shame more than fear. Accordingly, this may suggest that messages that leveraging guilt and shame may be effective in reducing distracted driving among young drivers, and therefore, can enhance road safety. Given that previous applications of physical threats and fear-based persuasion has been shown to be ineffective with young individuals (e.g., Pechmann et al., 2003; Schoenbachler & Whittler, 1996), social threats, which appeal to the emotions of guilt and shame, may be promising for public health interventions. As suggested by Rossiter and Percy (1987), communicating social threats usually evokes emotions of guilt, shame, and sadness. As such, in our study we focused on the negative emotions of guilt, shame, and fear and deemed them to be more appropriate than positive emotions in the context of mitigating illegal distractions.

Contrary to our second hypothesis, there was no difference between males and females in their intention to engage in cellphone distractions. While previous research comparing males' and females' self-reported engagement in cellphone distractions has mixed results (e.g., Barr et al., 2015, Sullivan et al. 2021, Bazargan-Hejazi et al., 2017), it is important to note that our sample size for male participants was small (N = 30) and as such further exploration on this point is needed. In accordance with our third hypothesis, our results demonstrated that females reported greater anticipation to experience guilt, shame, and fear for engaging in cell phone distractions than males. Quinn et al. (1992) and Lewis et al. (2007) showed that physical and social threats may be more effective with females than males. Accordingly, it is possible that physical and social threat-based messaging centered on distracted driving may be particularly effective with female drivers, as they anticipate feelings of shame, guilt, and fear to a greater extent than males. However, it is important to note that while our results suggest that males and females may experience a different magnitude of emotions resulting from distracted driving, such differences may not necessarily translate to differences in intention to engage in cellphone distractions.

There are a few limitations to the present work. Firstly, results are limited in that they are only observational in nature and as such are unable to provide causal inference between emotions and intentions. Secondly, the relatively smaller sample size for male participants limits the generalizability of our results. Additionally, the study was conducted in the form of an online survey, which can suffer from a multitude of issues such as participants' recall ability and the social desirability bias. Recall may have been an issue for our survey given that we asked our participants to respond based on their

behaviors and beliefs prior to the pandemic. Observational studies in controlled settings are required to evaluate the effectiveness of guilt- or shame-inducing messages in promoting safer driving practices. For example, future research could explore the effects of existing emotional manipulations (e.g., emotional road signs or road-side messages, or public safety advertisements) to determine whether leveraging emotions leads to a reduction in distraction engagement in younger drivers. Furthermore, studies in controlled environments, e.g., a driving simulator study, can study the role of emotions from a causal angle.

The results from this study demonstrate the relationship between anticipated emotions and intention to engage in cellphone distractions and point to potential interventions that may lead to safer driving behaviors in younger drivers. The survey however did not explicitly ask about the reasons for anticipated emotions, which can provide further insights into the relation between emotions and distracted driving. In general, further research is needed in this relatively understudied aspect of distracted driving research.

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