Accident Analysis and Prevention 99 (2017) 372–378

Contents lists available at ScienceDirect

Accident Analysis and Prevention

journal homepage: www.elsevier.com/locate/aap

Measuring a conceptual model of the relationship between compulsive cell phone use, in-vehicle cell phone use, and motor vehicle crash

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ARTICLE INFO

Article history:
Received 23 August 2016
Received in revised form 8 November 2016
Accepted 22 December 2016

Keywords:
Motor vehicle crashes
Cell phone use
Distracted driving
Accident risk

ABSTRACT

Objectives: Previous research suggests that anticipation of incoming phone calls or messages and impulsivity are significantly associated with motor vehicle crash. We took a more explanative approach to investigate a conceptual model regarding the direct and indirect effect of compulsive cell phone use and impulsive personality traits on crash risk.
Methods: We recruited a sample of 307 undergraduate college students to complete an online survey that included measures of cell phone use, impulsivity, and history of motor vehicle crash. Using a structural equation model, we examined the direct and indirect relationships between factors of the Cell Phone Overuse Scale-II (CPOS-II), impulsivity, in-vehicle phone use, and severity and frequency of previous motor vehicle crash. Self-reported miles driven per week and year in college were included as covariates in the model.
Results: Our findings suggest that anticipation of incoming communication has a direct association with greater in-vehicle phone use, but was not directly or indirectly associated with increasing risk of previous motor vehicle crash. Of the three latent factors comprising the CPOS-II, only anticipation was significantly associated with elevated cell phone use while driving. Greater impulsivity and use of in-vehicle cell phone use while driving were directly and significantly associated with greater risk of motor vehicle crash.
Conclusions: Anticipation of incoming cellular contacts (calls or texts) is associated with greater in-vehicle phone use, while greater in-vehicle cell phone use and impulsive traits are associated with elevated risk of motor vehicle crashes.

1. Introduction

Motor vehicle crash (MVC) continues to contribute up to 56% of fatal injuries for individuals ages 15–24, making it the leading cause of death for adolescents and young adults (WISQARS leading Causes of Death Reports, 2013). Adolescent drivers are at a higher risk for crash than any other age group (Williams, 2003). However, this risk decreases dramatically over the first few months after licensure, as drivers gain more experience (Mayhew et al., 2003). Lack of experience with risk-detecting and complex car-handling skills is a large contributor to elevated crash risk among young drivers (Shope and Bingham, 2008).

A high propensity toward impulsivity, including factors such as sensation seeking and emotional urgency, increases the susceptibility of adolescent drivers to engage in risky driving behaviors (Pearson et al., 2013). This impulsivity and greater risk-tendency can be attributed to several sensation-, excitement-, or experience-seeking motives (Hatfield and Fernandes, 2009). Thus, young drivers are more likely to overlook apparent risk or even pursue more risks while driving due to a high motivation for sensation-

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http://dx.doi.org/10.1016/j.aap.2016.12.016
0001-4575/

seeking behavior (Pearson et al., 2013). The relationship between sensation seeking and risky driving has been well-documented (Hu and Bentler, 1999), and a particularly elevated risk of MVC in adolescent drivers has been attributed to this behavioral factor (Mirman et al., 2012). Novice drivers are especially liable to being influenced by risk-taking and sensation seeking motives, and this reflects in their greater likelihood to engage in risky driving behaviors such as driving while distracted (Hu and Bentler, 1999). Social influence motives also play a large role in predicting risky behavior (Hatfield and Fernandes, 2009). An observational study reports that teenage drivers are more likely to engage in risky behaviors in the presence of a peer passenger (Simons-Morton et al., 2005). This emphasizes the importance of social influence in predicting risky behavior in young drivers.

Distracted driving is a common risky behavior, causing up to 10% of fatal and 17% of non-fatal, injury-causing crashes (Distracted Driving, 2013). A significant portion of this distraction is caused by cell phone use, particularly among young drivers (Distracted Driving, 2013). Close to 88% of adolescents have access to cell phones, and 90% of teenagers with cell phones report exchanging text messages (Lenhart et al., 2015). This high rate of usage also translates to in-vehicle use, with nearly 75% of young drivers who report using a cell phone while driving (Cook and Jones, 2011).

Texting while driving has a considerable negative impact on driving performance, causing physical, visual, and cognitive distraction (Caird et al., 2014). Frequent in-vehicle cell phone users tend to spend more time in the left lane, make more lane changes, make hard brake maneuvers more often, and drive faster; putting these drivers at greater risk for crash (Zhao et al., 2013). Despite reporting that using a cell phone while driving is distracting and dangerous, an overwhelming number of college students continue to engage in this behavior (Harrison, 2011). Risky cell phone use, such as this, has been linked to compulsive behaviors and other psychological characteristics such as alcohol use, impulsivity, and anxious relationship qualities (O'Connor et al., 2013). Currently, there is no recognized and validated tool to clinically measure or explicitly identify compulsive cell phone use, but it has been compared to diagnosable addiction disorders such as pathological gambling. Compulsive cell phone use has been characterized by symptoms such as anticipation of incoming communication, interference with daily life, emotional attachment to the phone, and individual recognition of problematic cell phone use (O'Connor et al., 2013).

Several states have enacted distracted driving laws and regulations restricting use of a cell phone while driving. However, current distracted driving laws are difficult to enforce, and it is not known whether these laws have been very effective in reducing rates of cell phone use while driving or related crash outcomes (McCartt et al., 2014). A study of North Carolina's restrictions on teenage drivers using cell phones revealed no significant long-term effect on reducing crash due to cell phone use (Goodwin et al., 2012). Furthermore, insurance collision loss data from four states indicates no decline in crash risk after the implementation of texting laws, and even a small increase in claims for three of these states (Anon, 2010). However, results of other studies have suggested a 3% reduction in crash-related fatalities and a 7% reduction in crash-related hospitalizations following the implementation of a state-wide primary texting ban (Ferdinand et al., 2015; Ferdinand et al., 2014).

In light of conflicting evidence about the effectiveness of distracted driving legislation, many questions remain addressing the growing prevalence of using a cell phone while driving. Little attention has been given to examining the psychological factors underlying in-vehicle cell phone use. A few studies suggest psychological causes for increased attachment to cell phones, which may translate to use while driving. Social factors such as self-identity, in-group norms, and a need to belong are among the predictors of greater cell phone involvement (Walsh et al., 2011). Due to these social pressures, the perceived importance of immediately responding to a text message or even initiating a phone conversation may often outweigh the apparent associated risk (Nelson et al., 2009).

The present study sought to replicate findings of O'Connor et al. (O'Connor et al., 2013) that anticipation of incoming phone calls or messages is significantly associated with crash risk, and further study this relationship in order to better explain the role of anticipation in predicting greater risk for crash. The previous study (O'Connor et al., 2013) took a more explorative approach to examining the psychological factors linking cell phone use with MVC, revealing associations between aspects of cell phone overuse and other clinical measures. The present study endeavored to take an explanative approach, extending the previous findings to investigate a conceptual model of compulsive cell phone use, in-vehicle phone use, impulsivity, and history of motor vehicle crash. In doing so, we sought to measure the direct and indirect effects mediating these relationships.

2. Methods

2.1. Study population and recruitment

We recruited 307 students enrolled in undergraduate psychology courses at a university in the southern United States. Upon being approved by the University Institutional Review Board, the study was advertised through the Psychology Study Board. Most students had the opportunity to earn class credit for participating in the study. Non-drivers (n = 11), those who did not own cell phones (n = 1), and those with missing data (n = 25) were excluded from the final analyses, leaving a final sample of 270 participants.

2.2. Compulsive cell phone use

The Cell Phone Overuse Scale-II (CPOS-II) is a 13-item measure which evaluates the frequency of potentially problematic cell phone use behaviors. Initial validation of the CPOS found greater compulsive cell phone use to be significantly associated with insomnia, somatic complaints, depression, and social dysfunction (Jenaro et al., 2007). A longer, 24-item version of the CPOS produced 4 separate factors of problematic cell phone use representing anticipation of incoming calls, cell phone interference with daily life activities, strong emotional reaction to the cell phone, and recognized problematic cell phone use (O'Connor et al., 2013). Previous research reveals a significant association between the CPOS and aspects of impulsivity, as well as a positive correlation relating the CPOS and MVC (O'Connor et al., 2013). The CPOS-II was created based on evidence that a shorter version would eliminate redundant items and maximize psychometric properties of the measure. For the current study, the CPOS-II demonstrated acceptable internal consistency ($\alpha = 0.87$).

2.3. Impulsivity

The Urgency Premeditation Perseverance Sensation Seeking—Positive Urgency (UPPS-P) Impulsive Behavior Scale contains 59 total items separated into five different subscales: planning, negative urgency, sensation seeking, persistence, and positive urgency (Whiteside et al., 2005; Cyders et al., 2007). The first four factors are strongly associated with aspects psychopathology and related disorders, and composed the original impulsivity scale(Whiteside et al., 2005). The role of positive mood states in predicting risky behavior was later examined, and the fifth factor was included (Cyders et al., 2007). The current study utilized this revised measure. To assess impulsivity, participants