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# Driving under the influence of distraction: Examining dissociations between risk perception and engagement in distracted driving

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ABSTRACT

Driving while distracted is a critical and unwavering problem in the United States leading to numerous injuries and fatalities each year. While increasing legislation and developing technological interventions strive to ensure we only focus on driving, individuals still drive distracted. We surveyed college-aged adults to examine the factors that influence both their risk perception of driving while distracted and how often they engage in distracting activities and situations while driving. We found a disassociation between individuals' perception of driving distraction risk and their engagement with the distraction. Exposure, perceived knowledge of risks, fairness beliefs, and ratings of perceived visual and cognitive demands was associated with risk perception. Conversely, risk-seeking traits, how voluntary the task was perceived, and previous exposure to a distraction influenced engagement. Overall, we recommend additional research focusing on factors that predict engagement in driver distraction rather than perceived risk alone.



## 1. Introduction

Driving while under the influence of distraction is a crucial and prominent issue in our society. Distraction induced driving errors are associated with the high cost of increased motor-vehicle crashes, injuries, and fatalities. The National Highway and Safety Administration (NHTSA) estimated that 3331 (10%) people were killed and another 387,000 were injured in vehicle crashes involving distraction in 2011 (NHTSA, 2012, 2013a). While the frequency of drivers who converse on the phone concurrently with driving has stabilized, drivers are now more likely to participate in distractions that require more engagement and glances away from the road: i.e. texting, internet use (e.g. social media, downloads, music), games, and video (NHTSA, 2013b). This trend is increasing more quickly among teenage and younger adult drivers (ages 16–24) than for any other age group (NHTSA, 2013c). Over time, society, and consequentially driving, is becoming progressively more technologized, ultimately creating new forms of distraction such as engagement in voice texting (Mayhew et al., 2013) and using personalized phone-based digital assistance (e.g. Siri on iPhone; Yager, 2013).This trend underscores the need to understand the factors that contribute to drivers' choices to drive while distracted, which have been studied insufficiently (Patel et al., 2008).

Driver distraction or the behavior of driving while distracted is defined as the driver redirecting attention from driving to perform supplementary behaviors, tasks, or situations that reduce the drivers' ability to maintain situation awareness, accurately engage in decision-making processes, and be in full control of the vehicle (Hedlund, 2005; Mayhew et al., 2013). Many empirical research studies have shown the potential dangers of driving while distracted (Regan et al., 2011; Young et al., 2012). Because driving is already a multifaceted and complex task, mistakes and performance decrements such as reduced lateral control, failures to recognize and obey signage, reduced hazard response times, and inattentional blindness are easily introduced when attention is diverted away to complete secondary activities (Recarte and Nunes, 2003; Regan et al., 2011; Robertson, 2012; Strayer and Drews, 2004). This ultimately increases the probability that the distracted driver will be involved in a vehicle crash. (Robertson, 2012; Young et al., 2012).

Distracted driving research has categorized distractions into two major classifications (Wallace, 2003), Internal: distractions within the vehicle (e.g. cell phones, in-car-entertainment) and external: distractions from outside the vehicle (e.g. billboards, pedestrians). Internal distractions have received the most attention, while external distraction research has been more limited (Rupp, 2012). This is partly because technology-enabled vehicles

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and using portable electronics in automobiles is becoming more prevalent which, in turn, is increasing the frequency and severity of in-car distraction (NHTSA, 2013b). Longitudinal research of internal distractions has revealed that distractions like conversation, cell phone use and reading were all common with food-related distractions being associated with the greatest number of adverse events (Feaganes et al., 2003). On the other hand, external distractions are actually more frequently encountered (Stutts et al., 2005) and account for a greater number of vehicle crashes (Stutts et al., 2000). One explanation for the power of external distractions posits that the number and variety of stimuli outside the vehicle contributes to a complex visual presentation that can clutter a driver's attention, preventing him or her from recognizing important information (Horberry et al., 2006). These distractions include: weather, work zones, billboards, and pedestrians (Bungum et al., 2005), bicycles (Schramm et al., 2010), motorcycles (Clarke et al., 2007), roadside crashes (Colon et al., 2013), and searching for street signs (Horberry and Edquist, 2009).

Additionally, few studies in the literature have investigated both risk perception and willingness to engage in a distraction (Titchener and Wong, 2010). Lerner and Boyd (2005) found willingness to engage and risk perception were a 1:1 relationship, but this study included only a small number of internal distractions. Risk perception studies have stated drivers perceive internal distractions as more risky to engage in than distractions that occur outside the vehicle (Patel et al., 2008; Titchener and Wong, 2010). On the other hand, perceptions of risk do not always match reality. Objective studies of adverse vehicle states (i.e. near misses and motor vehicle crashes) indicate external sources are equally risky (e.g. Feaganes et al., 2003). Thus, drivers may rate distractions that have been demonstrated to be risky as relatively low risk. Examples of this are drivers' perception of hands-free phone use, food distractions (White et al., 2004) and passenger conversations (McEvoy et al., 2007; Titchener et al., 2009). These distractions were rated as relatively low risk, but still distract the driver away from driving. Risk perception of external distracters has also not received as much focus as internal distracters (Patel et al., 2008), indicating a clear gap in the literature.

### 1.1. Importance of risk perception

Solving the problem of distracted driving especially among younger drivers may not be resolved by legislation (Sperber et al., 2010) or technological interventions (e.g. Parasuraman et al., 1997) because drivers often satisfice their driving performance (Hancock et al., 2009), opting instead to engage in a plethora of other activities (Regan et al., 2011). Individuals may engage in distracting behaviors for many reasons, principle among them are social norms (Atchley et al., 2012) and an over-inflated sense of self-efficacy (Kruger and Dunning, 1999). Often drivers may view that engaging in certain distractions are low risk behaviors because being involved in a vehicle crash generally is a relatively low probability occurrence (Hancock et al., 2009). Reason (2000) stated that complex human-machine system failures occur because multiple errors must occur simultaneously (like aligning the holes of several pieces of Swiss cheese). This means while drivers may have many "near misses", they may not form a strong connection between the risk of driving while distracted and being involved in a vehicle crash. However, while the crash risk is low for a single driver, taken across the number of drivers on the road, even a low probability occurrence leads to thousands of injuries and fatalities due to distraction each year (NHTSA, 2013a). Therefore, it is imperative to understand the factors involved with individuals' risk perception of various driving distractions (Patel et al., 2008; Slovic, 1987) and consequently their likelihood of engaging in distracting behaviors (Hatakka et al., 1997), which gives an indication of how seriously they take the perceived risk.

### 1.2. Predictors of perceived driving risk

Risk perception and engagement in distracting activities may be due to qualitative characteristics (QCs) of the distraction itself. Previous studies have shown QCs such as a driver's perception of control, risk knowledge, and perceived cognitive demand predicted driver's perception of crash risk (Patel et al., 2008). Other studies have stated that the legality of the activity, likelihood of crash risk, extent that the behavior is perceived to be voluntary or coerced (voluntariness), familiarity, and perceived fairness beliefs (the belief that engagement is justified or reasonable) were important predictors of risk (Patel et al., 2008; Titchener et al., 2009; Titchener and Wong, 2010). An increased familiarity with a particular distraction on average led to lower perceived risk (Lansdown, 2012). Further, greater perceived control over the distraction, fairness, and legality of a distraction were also associated with lower perceived risk. On the other hand, distractions that were perceived as more cognitively demanding or distractions to which people had less exposure were perceived as having a greater risk of causing a vehicle crash (Patel et al., 2008; Titchener et al., 2009).

Several other QCs have been shown in the literature to be relevant to engagement and risk perception, but have not yet been integrated with previous driving distraction risk perception studies indicating another research gap. The sensory, or processing modality of the distraction may further play a role in both risk perception and engagement of the distraction because tasks that demand resources from the same modality will degrade performance more than completing tasks that require different resources (Wickens, 2002). However, since driving is such a complex task, drivers must expend effort spanning multiple sensory or processing domains: visual, auditory, biomechanical, and cognitive (working memory, executive functioning; Williams-Bergen et al., 2011). Some types of distractions may only demand input of a single modality or combinations of modalities. For example, hand-held phone use requires biomechanical, visual, and cognitive input. On the contrary, hands-free phone use removes the need for biomechanical and possibly visual input, but still requires cognitive effort. Hands-free systems may even increase cognitive demands because the cues are not visually available. Instead, users must access and hold this information in memory, thus trading a visual demand for a more cognitive one. In other words, people not only have to think about the task, but the procedure required to complete the task as well as dealing with potential errors that may occur while using the system (e.g. speech-to-text recognition issues; Mayhew et al., 2013).

Finally, many risk perception studies have chosen to leave the term "risk" undefined (e.g. Patel et al., 2008) to not bias participants. However, we also note that data from Titchener et al. (2009) showed that individuals rated both the probability of having a vehicle crash and the perceived risk of the distraction very similarly, with accident probability accounting for 88% of the variance in risk perception. We argue that this multicollinearity stems from participants defining their subjective risk ratings as the likelihood of having a vehicle crash and thus may make this inappropriate as a predictor of risk perception.

### 1.3. Sensation seeking, risk taking and perceived risk

The extant literature fails to examine personality variables as they relate to risk perception and willingness to engage in distracted driving. Sensation seeking and risk taking behavior are both potentially relevant traits. Sensation seeking behavior is associated with the tendency to engage in riskier behavior while driving, especially among younger adults (Arnett, 2002). Specifically, high