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Texting while driving as impulsive choice: A behavioral economic analysis

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ABSTRACT

The goal of the present study was to examine the utility of a behavioral economic analysis to investigate the role of delay discounting in texting while driving. A sample of 147 college students completed a survey to assess how frequently they send and read text messages while driving. Based on this information, students were assigned to one of two groups: 19 students who frequently text while driving and 19 matched-control students who infrequently text while driving but were similar in gender, age, years of education, and years driving. The groups were compared on the extent to which they discounted, or devalued, delayed hypothetical monetary rewards using a delay-discounting task. In this task, students made repeated choices between $1000 available after a delay (ranging from 1 week to 10 years) and an equal or lesser amount of money available immediately. The results show that the students who frequently text while driving discounted delayed rewards at a greater rate than the matched control students. The study supports the conclusions that texting while driving is fundamentally an impulsive choice made by drivers, and that a behavioral economic approach may be a useful research tool for investigating the decision-making processes underlying risky behaviors.

1. Introduction

It has been widely recognized that texting while driving is a global safety issue in traffic injury and fatalities. In the United States, for example, the National Safety Council (2014) estimated that 5–14% of motor vehicle crashes, or 281,000–786,000 crashes per year, are attributed to texting while driving. According to the 2012 National Occupant Protection Use Survey (NOPUS), which provides the only nationwide probability-based observed data in the United States, 1.5% of drivers were observed to be texting or visibly manipulating hand-held devices while driving (Pickrell, 2014). The percentage is twice as high as the average in younger drivers (age 16–24), and the number generally has been rising since the survey started in 2005. The prevalence is similar in Australia (Young et al., 2010). Among college students in the United States, self-reported estimates of the prevalence of texting while driving revealed high frequencies of such behavior, ranging 74–92% among those surveyed (Atchley et al., 2011; Cook and Jones, 2011; Harrison, 2011).

To date, legislation to prohibit drivers from texting while driving has been adopted by 44 states in the U.S. and the District of Columbia, and it is a primary offense in all but five of those states (Governors Highway Safety Association, 2015). Despite widespread support among the general public and legislators, laws banning texting while driving are difficult to enforce (Gauld et al., 2014). To further complicate matters, evidence for the effectiveness of these laws in preventing texting while driving is mixed. Studies show that texting bans are not associated with reductions in the rate of texting while driving (Goodwin et al., 2012) or motor vehicle crashes (Ehsani et al., 2014). Indeed, Ehsani et al. observed a small but statistically significant *increase* in crash rate following the introduction of Michigan's texting restriction for all drivers. The authors posited that an increased crash risk might be due to a shift in drivers' texting behavior toward a more dangerous, concealed manner, resulting in increased duration of eye gazes away from the road (Simons-Morton et al., 2014).

Educational campaigns that increase awareness of the dangers of texting while driving are other strategies used to prevent texting while driving (e.g., Sherin et al., 2014). The rationale supporting the promotion of educational campaigns is the assumption that drivers lack relevant knowledge or awareness of the dangers of texting while driving. Since 2009, the U.S. Department of Transportation has launched various campaigns to increase the

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awareness of the dangers. In 2014, the National Highway Traffic Safety Administration (NHTSA) launched the first national highly visible enforcement and media campaign *U Drive. U Text. U Pay.*, which was supported by television, radio and digital advertising (NHTSA, 2015). Despite these efforts, however, it is unclear whether awareness of the dangers is sufficient to decrease actual texting behavior. For example, Atchley et al. (2011) found that awareness of the risks of texting while driving only weakly predicted avoidance of the behavior. Indeed, Ginsburg et al. (2008) found that teenagers, who engage in risky driving behaviors, including texting while driving, tend to believe they are less of a safety risk than teenagers who do not engage in such behaviors. Atchley et al. reported a similar finding and claimed that texting while driving alters the attitude toward texting through a reduction in *cognitive dissonance* (Festinger, 1957). Although there is little doubt that legislation and educational campaigns regarding texting while driving are worthwhile, the empirical evidence, when taken together, suggests that these efforts may need to be supplemented with other approaches to be maximally effective.

One approach is to examine the factors that give rise to texting behavior in the first place. Several studies, focused on investigating the psychological factors, identified several different personality traits that predict texting while driving. For example, texting while driving has been linked with the impulsivity-like personality trait of negative urgency, which refers to "the tendency to act impulsively when experiencing negative affect" (Pearson et al., 2013, p. 142), low levels of mindfulness (Feldman et al., 2011), habitual texting tendencies (Bayer and Campbell, 2012), cell phone dependence (Struckman-Johnson et al., 2015), perceived texting distractibility (only for males; Struckman-Johnson et al., 2015), and risky behavior tendencies (only for females; Struckman-Johnson et al., 2015). Finally, consistent with the theory of planned behavior (Ajzen, 1991), Nemme and White (2010) found that drivers' intentions to text while driving, which are influenced by personal attitudes, subjective norms, perceived control, reference group norms, and morality norms, effectively predict actual behavior of texting while driving.

It is important to note, however, that many psychological investigations rely on measures that are subjective in nature and rely entirely on individuals' self-evaluation of their own behaviors, sometimes across many different settings over long periods of time (Spinella, 2005). Although self-report measures are generally accepted as valid instruments to assess various personality traits such as impulsivity (Loree et al., 2014), more objective, behavioral measures may be useful complements to capture different dimensions of psychological phenomena without relying on individuals to accurately characterize their own behavior (Ledgerwood et al., 2009). Furthermore, although the results based on self-report measures may offer predictive utility in classifying individuals at risk for texting while driving, they do not greatly contribute to a better understanding or characterization of the underlying behavioral or cognitive processes. Methods that use more objective, behavior-based measures may overcome some of these limitations. One promising research and conceptual strategy is to employ a behavioral economic approach.

Behavioral economics refers to "the application of economic concepts and approaches to the molar study of individuals' choices and decisions" (Bickel et al., 2014a, p. 643). From a behavioral economic perspective, texting while driving may be conceptualized as a tendency toward *impulsive choice*, which is defined as choosing smaller immediate rewards over larger delayed rewards (Rachlin and Green, 1972). That is, texting while driving involves a trade-off between immediate and delayed outcomes, and it manifests behaviorally as a preference for smaller immediate rewards (e.g., short text messages while driving) over larger delayed rewards (e.g., a longer conversation sometime later when not driving).

Instead of viewing impulsive choice as manifestations of "irrational" decision-making, a behavioral economic approach posits that an impulsive choice is made because the subjective value of a delayed reward is *discounted* as a function of the time to its receipt (see Green and Myerson, 2004, for review). The process by which the decision maker subjectively devalues future events is termed *delay discounting* (Madden and Bickel, 2010). Delay discounting is one of the central principles in behavioral economics (Bickel and Marsch, 2001), and it serves as an index of an individual's preference for small immediate rewards over large delayed rewards, akin to the difficulty of delaying gratification (MacKillop et al., 2011).

Delay discounting is also considered to underlie other forms of impulsive decision making, and the process is highly relevant to a range of impulse control and addictive disorders (Madden and Bickel, 2010). For example, numerous research studies have shown that delay discounting plays a critical role in impulsivity-related problems, including but not limited to substance dependence and abuse (e.g., MacKillop et al., 2011), obesity (e.g., Bickel et al., 2014c), pathological gambling (e.g., Dixon et al., 2003), internet addiction (e.g., Saville et al., 2010), risky sexual behavior (e.g., Chesson et al., 2006), and criminal behavior (e.g., Arantes et al., 2013). Texting while driving shares some key features with addictive, risky, and criminal behaviors in that it also involves trade-offs between small, immediate outcomes and large, delayed ones.

Studies on delay discounting with human participants (e.g., Rachlin et al., 1991) are similar to psychophysical experiments (Richards et al., 1997). In the typical procedure, participants are exposed to a series of choice trials in which they choose between receiving a smaller reward available immediately (e.g., $800 right now) and a larger reward available after a delay (e.g., $1000 in 1 year). Across the series of the choice trials, the amount of the smaller immediate reward is adjusted to identify the point at which the participant switches their preference from the larger delayed reward to the smaller immediate reward. This switching point indicates a *point of indifference*, where the subjective value of the smaller immediate reward and the larger delayed reward are equivalent. The series of choices is repeated across several delays, yielding indifference points that decrease as the delays increase.

Numerous previous studies have found that the hyperbolic function developed by Mazur (1987) well describes the devaluation or discounting of a reward as a function of delay:

$$V_d = \frac{A}{1 + kD'} \tag{1}$$

where V_d refers to the subjective or discounted value of a delayed reward, A refers to the reward amount, D refers to the delay to the reward, and k is an empirically derived parameter that reflects the rate of discounting. The higher k values indicate greater discounting and thus greater impulsivity (e.g., Bickel and Marsch, 2001).

To date, only one study has investigated delay discounting in the context of texting. Atchley and Warden (2012) investigated whether the subjective value of a combination of hypothetical monetary rewards and hypothetical opportunities to reply to a text message is hyperbolically discounted as a function of delay to reply. In one scenario of their study, college students chose between one alternative of receiving a smaller amount of money (e.g., $5.00) and replying to a text message immediately and another alternative of receiving a larger amount of money ($100) and delaying a reply (e.g., 60 min). They found that the subjective value of the combined rewards was hyperbolically discounted as a function of delay to reply.

Although Atchley and Warden (2012) study demonstrated that delay discounting methods can provide insights related to individuals' decision making in some texting scenarios, it remains to be seen whether a measure of delay discounting differentiates drivers who frequently text while driving and drivers who do not