



Intentions and willingness to drive while drowsy among university students: An application of an extended theory of planned behavior model[☆]

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ABSTRACT

A web-based questionnaire was used to assess the utility of constructs from the Theory of Planned Behavior (TPB) and the Prototype Willingness Model (PWM) to predict intentions and willingness to engage in drowsy driving in a sample of 450 university students. Those students who reported more favorable attitudes and subjective norm and greater perceived control and willingness in relation to drowsy driving behavior were more likely to report stronger intentions to engage in drowsy driving behavior. Augmenting the TPB constructs with the PWM construct of willingness significantly explained up to an additional 8 percent of the variance in drowsy driving intention. Perceived behavioral control and willingness were consistently the strongest predictors of drowsy driving intention in the augmented model, which together with the control (personal) variables explained up to 70 percent of the variance in intention. Thus, the Theory of Planned Behavior and the Prototype Willingness Model may be useful for understanding motivational influences on drowsy driving behavior in young people and present promising theoretical frameworks for designing more effective interventions against drowsy driving in this population.

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1. Introduction

1.1. Drowsy driving in the United States

Drowsy driving¹ is a significant public health and safety problem in the United States (National Sleep Foundation, 2007) and around

the world (Connor et al., 2001; Gonçalves et al., 2015). The AAA Foundation for Traffic Safety recently estimated that drowsy drivers were involved in an average of 328,000 police-reported automobile crashes each year in the U.S., including 109,000 crashes resulting in injuries and 6400 fatal crashes (Tefft, 2014). In various surveys since the 1990s, about half of U.S. drivers reported driving while drowsy and about a third reported falling asleep behind the wheel at least once in their lifetime (McCartt et al., 1996; National Sleep Foundation, 2005; Tefft, 2010). Drivers between the ages of 16 and 29 years are particularly at-risk for becoming involved in drowsy driving crashes and have high prevalence rates of drowsy driving episodes (AAA Foundation for Traffic Safety, 2011, 2012; Pack et al., 1995; Wheaton et al., 2013, 2014).

The U.S. Government has responded to this problem by including the reduction of drowsy driving crashes on U.S. roadways as an objective in its *Healthy People 2020* agenda for improving the nation's health (U.S. Department of Health and Human Services, 2010). In addition, traffic safety experts have long advocated for drowsy driving interventions grounded in behavioral change theories (Commonwealth of Massachusetts, 2009; Foss,

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¹ As used in this manuscript, "drowsy driving" means the act of operating a motor vehicle while drowsy, sleepy, asleep, or fatigued (National Highway Traffic Safety Administration, 2011). It should be noted that although the terms drowsiness, sleepiness, and fatigue often are used interchangeably in the drowsy driving literature, each of these terms have unique definitions in the field of sleep research (Jones et al., 2010; National Center on Sleep Disorders Research/National Highway Traffic Safety Administration, 1998).

2007; National Center on Sleep Disorders Research, 2011; National Center on Sleep Disorders Research/National Highway Traffic Safety Administration, 1998; National Sleep Foundation, 2007; Thiffault, 2011 National Sleep Foundation, 2007; Thiffault, 2011). However, little is currently known about the utility of such theories in explaining drowsy driving behavior.

1.2. Theoretical framework

1.2.1. Theory of planned behavior

The Theory of Planned Behavior (TPB) asserts that the best predictor of a person's actual behavior is the person's intention to perform the behavior (Ajzen, 1991). Behavioral intention reflects a person's motivation as shown by how much of an effort the person is willing and planning to exert to perform a behavior (Ajzen, 1991). According to the TPB, behavioral intention is preceded by three cognitive antecedents: (1) favorable or unfavorable *attitude(s) toward the behavior*; (2) *subjective norm*, or "the perceived social pressure to perform or not to perform the behavior"; and (3) *perceived behavioral control*, or the perceived ease or difficulty of performing the behavior, which is assumed to "reflect past experience as well as anticipated impediments and obstacles" (Ajzen, 1991, p. 188; Conner and Armitage, 1998; Ravis and Sheeran, 2003). People with more favorable attitudes and subjective norm and greater perceived control regarding a behavior should have stronger intentions to perform the behavior (Ajzen, 2006). The relative importance of these three cognitive antecedents as predictors of behavioral intention varies for different behaviors and in different situations. Furthermore, the TPB postulates that perceived behavioral control can influence behavior directly, especially where it can be used as a substitute for a measure of actual control (Ajzen, 1991). Perceived behavioral control is closely associated with the concept of perceived self-efficacy (Ajzen, 1991, 2002), which refers to "people's beliefs about their capabilities to exercise control over their own level of functioning and over events that affect their lives" (Bandura, 1991, p. 257).

Since the TPB was introduced in the early 1990s, numerous studies have demonstrated its utility in explaining intentions and actual engagement in risky driving behaviors such as speeding (Conner et al., 2007; Elliott et al., 2003; Warner and Åberg, 2006), mobile phone use while driving (Nemme and White, 2010; Zhou et al., 2009), drunk driving (Chan et al., 2010; Ravis et al., 2011), and other driving violations (Parker et al., 1992). The TPB also has been used to design interventions against such risky driving behaviors (Elliott and Armitage, 2009; Stead et al., 2005). However, its utility has not been assessed in drowsy driving situations, particularly in adolescents and young adults (hereinafter, "young people").

1.2.2. Extending the theory of planned behavior: the prototype willingness model

Young people differ from older adults in their egocentrism and risk-taking behavior (Elkind, 1967; Frankenberger, 2000; Lapsley and Hill, 2010), and the TPB has been modified to reflect their greater sense of invulnerability to danger (*i.e.*, the over-optimistic perception that one is less vulnerable than others to danger), over-estimation of their control over situations, and greater willingness to perform risky behaviors (Chan et al., 2010; Gibbons et al., 1998a). The Prototype Willingness Model (PWM) of Adolescent Health Risk Behavior was developed from such modifications of the TPB to predict behaviors that are considered impulsive (including those that are volitional, but unintended or unplanned) and socially undesirable (Gerrard et al., 2008, 2005). This model has been used primarily in longitudinal study designs to predict future behavior.

According to the PWM, two types of decision-making contribute to adolescent risk behavior: (1) a *reasoned path* similar to that described in the TPB involving more analytic processing to account

for intentional or planned risk behaviors; and (2) a *social reaction path* involving more heuristic processing to account for unintended or unplanned behavior. The social reaction path originates with *risk prototypes* (*i.e.*, a person's images of the type of individuals who engage in particular risky behaviors) and proceeds through *behavioral willingness* (*i.e.*, a person's openness to engaging in particular risky behaviors in circumstances that are conducive to that behavior even if the person had not previously intended or contemplated engaging in the behavior) to actual behavior (Gerrard et al., 2008, 2005). Furthermore, the PWM postulates that previous behavior is an antecedent of both the reasoned and social reaction paths (Gerrard et al., 2008, p. 36, Fig. 1; Gibbons et al., 1998, p. 1169, Fig. 2).

Behavioral intention and behavioral willingness are distinguishable primarily by the deliberative nature of the former and the reactive nature of the latter (Gibbons et al., 1998a, 1998b). Whereas "intentions are plans that have been formulated in order to achieve a particular goal state through certain, instrumental actions" and "involve contemplation of the behavior and, usually, of its consequences," willingness "does not involve goal states, plans, or instrumental actions" and "involves relatively little forethought, which means less consideration of outcomes or consequences" (Gibbon et al., 1998b, p. 321). Meta-analyses of the literature on the TPB (Godin and Kok, 1996) and PWM (Todd et al., 2014) have revealed that both intentions and willingness are strong predictors of future behavior.

Ravis et al. have argued that the TPB's conceptualization of social influence is too narrow and that augmenting the TPB with PWM constructs enhances the predictive utility of the TPB by better capturing the role of social contextual factors in determining intentions (Ravis et al., 2006). These researchers have reported some empirical support for augmenting the TPB with PWM constructs to explain young people's intentions to engage in various health behaviors (Ravis et al., 2006). Empirical support for the predictive utility of constructs from the TPB and PWM in relation to young people's willingness to engage in risky driving behavior has also been reported (Ravis et al., 2011).

1.2.3. An "Extended" theory of planned behavior model for drowsy driving

An "extended" TPB model for explaining drowsy driving behavior in young people was constructed by augmenting the traditional TPB constructs with the PWM construct of behavioral willingness and incorporating several personal variables (Fig. 1). Combining constructs in this way is well-suited for explaining drowsy driving behavior in young people. The TPB originated as an extension of the Theory of Reasoned Action (TRA) to account for behaviors over which individuals have incomplete volitional control, such that the individual cannot completely decide at will to perform or not perform the behavior (Ajzen, 1991; Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975). Drowsy driving exemplifies such a behavior: individuals cannot always decide at will whether or not to perform a behavior, as in the case of the driver who becomes unexpectedly sleepy or dozes off while driving. Drivers who are initially alert but who become drowsy still drive with full volition, but with unplanned (unintended) drowsiness. However, drivers who get behind the wheel when already feeling drowsy engage in a planned (intended) behavior. This ambiguity over the unplanned or planned nature of drowsy driving behavior supports the augmentation of the traditional TPB (which focuses on a rational path of decision-making) with the construct of behavioral willingness (from the PWM's social reaction path of decision-making) in the extended TPB model for drowsy driving.

Because drowsy driving is a form of risky behavior, risk perception and sense of invulnerability may be independent predictors of drowsy driving intention and willingness. They also may influence

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