



Investigating driver willingness to drive through flooded waterways



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ABSTRACT

Approximately 40% of all drowning deaths involve a motor vehicle. Regardless of its significance as a cause of flood-related mortality, there is continued prevalence of driving through flooded waterways in Australia and worldwide. We aimed to understand the motivational determinates of driving through flooded waterways in low and high-risk scenarios by utilizing an augmented theory of planned behaviour (TPB) with behavioural willingness as the outcome variable as well as the influence of additional predictors; namely perceived risk and past behaviour. Participants ($n = 174$; $M_{age} = 27.43$, $SD = 10.76$) answered standard TPB-based questions in regards to attitudes, subjective norm, and perceived behavioural control (PBC), as well as additional variables of perceived risk (i.e., perceived susceptibility and perceived severity) and past behaviour. Support was found for the augmented TPB as attitude, subjective norm, and PBC predicted behavioural willingness. Support was also found for perceived severity in the high-risk but not the low-risk scenario. No support was found for perceived susceptibility. Past behaviour emerged as a significant predictor of willingness in the low and high-risk scenario. The findings provide support for an augmented TPB in understanding individuals' willingness to drive through flooded waterways, suggesting that a multi-strategy approach may be critical in attempts to reduce the incidence of such risky driving behaviour.

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1. Introduction

Floods are among the most widespread of natural disasters and are cited as the highest cause of mortality due to drowning throughout the world (Ashley and Ashley, 2008; Berz et al., 2001). Flood related drowning deaths are continuing to rise in Australia. A reported risk factor of many drowning fatalities is driving through flooded waterways (Royal Life Saving Society Australia, 2013), with 54% of flood related river drowning deaths between 2002 and 2012 ($n = 2965$) a result of non-aquatic transport (Peden and Queiroga, 2014). Regardless of its significance as a cause of flood-related mortality, little is known about risk factors for motor-vehicle related drowning (Yale et al., 2003). Research has found that people continue to ignore flood warnings and choose to drive into flooded roads. Drowning death research by FitzGerald et al. (2010) found that the use of a motor vehicle was involved in drowning deaths 48.5% of the time and 39.7% of this was attempting to negotiate flooded bridges, streams, and roads. Other noteworthy research has found between 35 and 60% of all drowning deaths to be vehicle related (Coates, 1999; Jonkman and Kelman, 2005; Perry, 2012).

It is apparent that most drivers are often unsuccessful in recognizing the risks associated with flooded waterways. Research investigating driving through flooded waterways leads to a number of common findings: (a) six inches (approximately 15 cm) of water will reach the bottom of most passenger cars which can cause loss of control and even stalling (NOAA, 2012), (b) many cars will start to float in as little as 30 cm of water, and (c) virtually all cars including four-wheel drives will float in 60 cm of water (Royal Life Saving Society Australia, 2013). Once a vehicle becomes buoyant the water will easily push it sideways. At this point, most vehicles will then tend to roll over leaving only seconds for those inside to escape.

Many fatalities associated with floods can be avoided and, to address this issue, policy makers in Queensland, Australia employed a campaign with the slogan "If it's flooded, forget it" after the January 2011 floods. Additionally, the city council on the Gold Coast, Queensland, Australia employed a two-pronged floodwater safety campaign that was directed at (1) primary school aged students through their schooling and (2) motorists through advertising and communications about flooding 'hotspots'. Despite these campaigns, a consistent number of vehicle-related drowning deaths are still being reported each year in Australia (approximately 7% between 2012 and 2013). It is evident, therefore, that death due to driving through flooded waterways is still an area of concern, not only in Queensland but nationwide (Peden and Queiroga, 2014; Royal Life Saving Society Australia, 2013). A possibility for the

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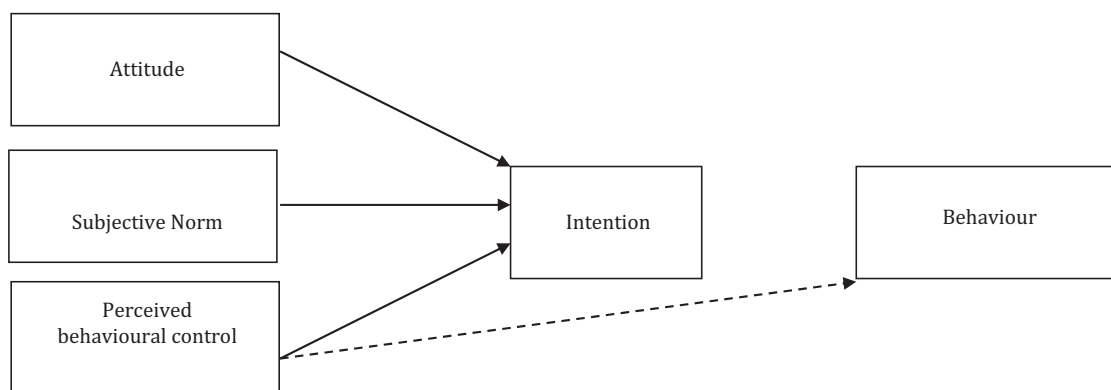


Fig. 1. The theory of planned behaviour (Ajzen, 1991).

continued deaths in this area is that previous efforts to combat such drowning have focused on providing knowledge rather than taking a sound theoretical approach to understand the social-cognitive processes that guide people's actions in this context. Furthermore, campaigns to induce behaviour change need to have an intrinsic effect on people's behaviour, in this case the driver's decision to drive through a flooded waterway, to more effectively reduce various health-risk behaviours and refrain from such actions over time (Curry et al., 1991). To effectively reduce the rate of motor vehicle-related drowning it is necessary to first establish empirical evidence on key determinants that guide people's decisions to drive through flooded waterways (Abraham et al., 2000). Applying theory and sound decision making models to understand better individuals' behaviour will aid in the development of more effective intervention programs (Abraham et al., 2000; Ajzen, 2014; Michie and Johnston, 2012) to combat this risky driving behaviour and ultimately save human lives.

1.1. The theory of planned behaviour

Meta-analytic reviews provide support for the TPB in explaining people's intentions and behaviour (Conner et al., 2002). Armitage and Conner (2001) examined 185 independent studies across a range of social and health behaviours and found the TPB to explain 27% and 39% of the variance in behaviour and intention respectively. Despite recent arguments against the TPB (Snihotta, Presseau, & Araújo-Soares, 2014), the theory of planned behaviour (Ajzen, 1991; Ajzen and Madden, 1986) remains a well validated decision making model (Ajzen, 2014; McEachan et al., 2011) that has been used extensively to explain human social and health behaviours (Armitage and Conner, 2001; Godin and Kok, 1996). The TPB is regarded as a deliberative processing model and suggests that individuals' decisions are constructed after systematic consideration of available evidence (Ajzen, 1991, 2014). In this model, the intention to engage in a given behaviour is the most proximal determinate of behaviour. Intentions include the motivational aspects that influence behaviour; they indicate how hard people are prepared to try and how much energy they are willing to apply in order to perform the considered behaviour (Ajzen, 1991). Intention is a function of three conceptually distinct determinants, which include attitudes, subjective norms, and perceived behavioural control (PBC). Attitude towards the behaviour refers to the individual's global positive or negative evaluation or assessment of performing the behaviour. Subjective norm is a social factor that reflects perceived pressures from significant others to perform or not to perform the target behaviour. PBC (which is also proposed to influence behaviour directly) refers to the perceived extent to which the behaviour is under volitional control and whether the individual believes they have the necessary resources and

opportunities to perform the behaviour (Ajzen, 1991). The PBC construct is congruent to Bandura's self-efficacy construct (Bandura, 1977, 1989) which refers to individual's beliefs about their confidence in their capabilities to have control over events that affect their lives and their own level of functioning. Refer to Fig. 1.

The TPB has been successful in explaining a variety of risky driving behaviours including texting/calling while driving (Walsh et al., 2008), dangerous over-taking (Forward, 2009), and speeding in rural (Letirand and Delhomme, 2005; Wallen Warner and Aberg, 2008) and urban areas (Elliot et al., 2003, 2005; Parker et al., 1992; Wallen Warner and Aberg, 2008). Given the support for the TPB in general and in the context of risky driving behaviours, the current study adopted the model to understand driving through flooded waterways. The base model (i.e., attitude, subjective norm, and PBC) was conceptualized as per the original TPB proposed by Ajzen (1991); however, a number of adjustments were proposed to develop an augmented model in order to gain a better understanding of why people may drive through flooded waterways.

1.2. The current study's augmented theory of planned behaviour

Despite the support for the TPB, a number of criticisms for the model remain. First, for the majority of attitude-behaviour models, the underlying assumption is that the decision to engage in a specific behaviour is a rational and goal-directed process (Gibbons et al., 1998a). Accordingly, these models may not fully account for the more impulsive and irrational nature of people's actions (Gibbons et al., 1998b). Due to the risky nature of driving through flooded waterways, a measure of willingness is potentially more appropriate than measuring an individuals' intent in the current study's context. Furthermore, given the large proportion of variance remaining unaccounted for by the TPB (Armitage and Conner, 2001), it is suggested that there is flexibility for improving the prediction of both intentions and behaviour and that potentially important, theoretically relevant influences be considered. Given the risk undertaken when driving through a flooded waterway, the current study sought to investigate perceptions of risk, adopted from the Health Belief Model (HBM; Janz and Becker, 1984), in this risky driving context. It has also been argued that past behaviour may be a useful addition to the TPB (Conner and Armitage, 1998). Prior behaviour may have an impact on future behaviour that is independent of the effects of beliefs, attitudes, subjective norms, and intentions (Ajzen, 1991; refer to Fig. 2).

1.2.1. Willingness to drive through flooded waterways

In regards to predicting health-promoting behaviour, the rational approaches have performed well; however, these models have been less successful in predicting behaviours that are considered to

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