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Stop there's water on the road! Identifying key beliefs guiding people's willingness to drive through flooded waterways

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Abstract

Floods are among the most widespread of natural disasters and exposure to floodwaters increases drowning risk. A leading cause of flood related drowning deaths is driving through flooded waterways. Drawing on the Theory of Planned Behaviour, a two-phased research program was conducted. Phase 1 (N = 25; M_{age}= 32.38, SD = 11.46) identified common beliefs about driving through a flooded waterway. Phase 2 (N = 174; M_{age}= 27.43, SD = 10.76) adopted a cross-sectional design to examine the belief predictors of drivers' willingness to drive through a flooded waterway. Given differences in consequences due to the depth of water, scenarios of low (road covered in 20cm of water) and high (road covered in 60cm of water) risk situations were investigated. A range of beliefs emerged as predicting drivers' willingness to engage in this unsafe driving behaviour. These included attitudinal beliefs (e.g., sustain vehicle damage, become stuck/stranded), beliefs of social expectations (e.g., pressure from friends, family members, police), and efficacy beliefs (e.g., small distance of water to drive through, presence of signage). The results of the current study support using a Theory of Planned Behaviour belief-based approach to the understanding of risky transport-related aquatic activities. The findings highlight the role that specific key beliefs play in guiding people's willingness to drive through flooded waterways and, in turn, provide possible targets for future interventions to curb this risky and potentially fatal driving behaviour.

1. Introduction

Floods, the most widespread of all natural disasters, are a leading cause of death related to drowning worldwide (Ashley & Ashley, 2008; Berz et al., 2001; World Health Organization, 2014). Drowning risks increase with floods, particularly in low and middle income countries, and it is estimated that between 1980 and 2009 there were over 500,000 deaths from floods worldwide (World Health Organization, 2014). Flood related drowning deaths are also an issue in high income countries where, in Australia for example, they accounted for 17% of all unintentional fatal drowning in rivers, creeks, and streams between 2002 and 2012 (Peden & Queiroga, 2014). In Australia, rapid onset floods occur; however, slow onset floods in rivers are the most common (Australian Emergency Management Institute, 2013). A reported risk factor of many flood related drowning fatalities is driving through flooded waterways. Research in Australia between 1997-2008 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 cross a waterway (FitzGerald et al., 2010). A study of unintentional fatal drowning in Australian rivers also identified 54% of all flood related drowning deaths occurred as a result of motor vehicles intentionally entering flood waters or vehicles being swept in (Peden & Queiroga, 2014). Research suggests that driving through floodwaters is a common type of flood experience (Franklin et al., 2014); however, little is known about risk factors for motor vehicle-related drowning (Yale et al., 2003).

Research investigating the risks of driving through flooded waterways suggests that approximately 15 centimeters of water will reach the bottom of most passenger cars which can cause loss of control and stalling, and 60 centimeters of water will cause virtually all cars including four-wheel drives to float (NOAA, 2012; Royal Life Saving Society Australia, 2011). When a vehicle becomes buoyant the water will push it sideways, and at this point, most vehicles will roll over, leaving those inside with only seconds to escape. Once a person starts to drown, the outcome is often fatal (World Health Organization, 2014). Although we have some understanding about the consequences of driving through flooded waterways due to the depth of water, there is a dearth of knowledge about why people engage in this risky behaviour.

Research undertaken in America suggests that people who deliberately drive through floodwater have a lack of knowledge about the risks and perceive flood warnings as not being indicative of real threat (Drobota et al., 2007, 2006). To address the issue, campaigns such as "Turn Around, Don't Drown" (NOAA, 2004) were released. This campaign was developed in the United States by the National Oceanic and Atmospheric Association (NOAA) in the early 2000s in response to findings from the Centre for Disease Control and Prevention who found over half of all flood-related drownings occur when a vehicle is driven into flood waters,

with the next highest percentage occurring as a result of walking in or near flood waters (CDC, 2000). The campaign aimed to remind people of the preventative nature of these incidents and discourage people from diving past flood warning barriers (NOAA, 2004).

In Queensland, Australia policymakers employed a campaign with the slogan "If it's flooded, forget it" after the January 2011 floods, which resulted in 35 people losing their lives (almost a quarter due to people attempting to drive through flooded waterways) and 78% of the state declared as a disaster zone (Queensland Floods Commission of Inquiry, 2012). Although these campaigns have been aimed at reducing the number of unintentional drowning deaths, very little research to date has evaluated the success of these campaigns on people's attitudes, beliefs, and, critically, actual drowning rates. As many fatalities associated with driving through floodwaters can be avoided, further preventive action is vital (World Health Organization, 2014). Given motor vehicle-related drownings are largely preventable, decisions informing this risky act are likely to be psychological in nature, involving a range of social and motivational factors. Although mechanisms exist which can help to understand why individuals may decide to drive through a flooded waterway (see Pearson & Hamilton, 2015), the peer-reviewed literature to guide public health messages is lacking. Theory-based campaigns are more effective in promoting health-protective behaviour compared to atheoretical ones, and evaluation of advertising countermeasures is easier and more cost effective with theoretically devised approaches given the clearly measurable constructs (Stead, Tagg, MacKintosh, & Eadie, 2005). However, a major criticism of the design of many health advertising campaigns is the neglect of psychological theory. Given psychological factors are likely to be critical in individuals' decisions to engage in risky transport-related aquatic activities, it is important that future behavioural interventions grounded in sound psychological theory are adopted to modify people's risky driving behaviours around water.

1.1 The Theory of Planned Behaviour: Behavioural, Normative, and Control Beliefs

In trying to understand the safety actions of drivers, the current study draws on a sound social psychological model of decision-making, the Theory of Planned Behaviour (TPB; Ajzen, 1991). The model states intention as the most proximal predictor of behaviour, with intention determined by three social-cognitive variables: attitudes (overall positive/negative evaluations of performing the behaviour), subjective norms (perceived social pressure from important others to perform the behaviour), and perceived behavioural control (perceived amount of control over behavioural performance; also theorized to predict behaviour directly) predict intention, with intention and perceived behavioural control predicting behaviour (Ajzen, 1991). Meta-analytic studies support the use of the TPB in predicting people's health and social behaviours (e.g., Armitage & Conner,

2001; McEachan, Conner, Taylor, & Lawton, 2011) , including risky water-related behaviours (Hamilton & Schmidt, 2014).

An important feature of the TPB is the hypothesis that the antecedents of attitudes, subjective norms, and perceived behavioural control are corresponding salient behavioural, normative, and control beliefs, respectively, reflecting the systems of beliefs that underpin an individual's intention and behaviour (Ajzen, 1991, 2015). These beliefs can be used to develop theoretically-based and empirically-driven behaviour change messages that are relevant to the target group (Ajzen, 2015; Epton et al., 2014; Hardeman et al., 2002). Formative research on beliefs, therefore, is necessary not only for depth of understanding of the behaviour in a given population but to test theory and the efficacy of the TPB mechanisms in changing behaviour, although researchers seldom conduct this necessary formative work (Ajzen, 2015; Epton et al., 2014). A growing number of studies have adopted the TPB framework to elicit beliefs for a range of health-enhancing behaviours (Chan et al., 2015; Hamilton, et al., 2012; Kane, Hyde, & Hamilton, 2014; Sainsbury & Mullan, 2011; Spinks & Hamilton, 2015) and, more relevant to the current study, risky water safety bheaviours including swmming between the flags (Hamilton, White, Wihardjo, & Hyde, in press) and swimming while intoxicated (Hamilton & Schmidt, 2013). In addition, the TPB has been successfully applied to behaviour change interventions (Fife-Schaw, Sheeran, & Norman, 2007; Hawkes et al., 2011; Kothe, Mullan, & Butow, 2012; Parker et al., 1996; Sainsbury, Mullan, & Sharpe, 2013). Given the important role beliefs play in guiding decision making, the current study sought to investigate the key beliefs underpinning people's decisions to drive through a flooded waterway.

1.2 The Current Study

While previous studies have identified TPB beliefs in accident and injury prevention, to date, no research has investigated people's beliefs underpinning drowning incidents related to driving through flooded waterways, nor done so via adopting a theoretically rigorous approach. The aim of the current research was to identify the key behavioural, normative, and control beliefs that guide people's willingness to drive through a flooded waterway. In the current study, a measure of willingness (which is examined more frequently in the context of the prototype willingness model; Gibbons, Gerrard, Blanton, & Russell, 1998) was considered more appropriate than assessing intentions given that driving through flood waters may involve less planned action (given the often spontaneous nature of the situation) and more reactive rather than deliberate decision making processes. In addition, given differences in consequences due to depth of water are evident in the literature, scenarios of low (road covered in 20cm of water) and high (road covered in 60cm of water) risk situations were

investigated. It was expected that significant correlations between the behavioural, normative, and control beliefs and willingness would be observed; and that some of the significant key beliefs would independently predict willingness to drive through a flooded waterway.

2. Method

2.1 Target behaviour

The target behaviour was, *driving through a flooded waterway*. The term "flooded waterway" was defined based on the Australian Government Department of Geoscience Australia (2013) and operationalised as, "an overflowing of water onto land that is normally dry and is not limited to roads". Two driving scenarios depicting a low and high-risk situation of driving through a flooded waterway (Perry, 2012; Queensland Government, 2011) were presented: "You are driving in a mid-size car immediately after a thunderstorm. You approach a section of the road that is completely covered in 20cm of water" (low risk); "You are driving in a mid-size car immediately after a thunderstorm. You approach a section of the road that is completely covered in 60cm of water" (high risk). The generic description of each scenario was adopted from Drobot, Benight and Gruntfest (2007).

2.2 Phase 1: Pilot study

A Pilot Study, following guidelines as outlined by Fishbein & Ajzen (1975) was conducted to identify the most frequently occurring salient beliefs, which served as the belief-based TPB measures with respect to each of the two driving scenarios in the Phase 2 Main Study. Participants completed a paper-based survey which asked them to respond to the same set of open-ended questions for each scenario. An information sheet was provided and completion and submission of the survey was considered as informed consent. A convenience sample of 25 individuals (18 male, 7 female), aged between 17 to 51 years (M_{age} = 32.38, SD = 11.46) participated in the pilot study.

To elicit salient beliefs, participants were asked to list the advantages and disadvantages of driving through the flooded waterway in each scenario. As beliefs considered to be most important are more accessible in memory (van Harreveld, van der Pligt & de Vries, 2000) and people draw from a small number of these important beliefs to guide their decision making (van der Pligt & de Vries, 1998), the most regularly occurring responses formed the rationale of the measures used to analyze behavioural, normative, and control beliefs. Given the variety of beliefs elicited in the pilot study, beliefs that exceeded a 30% frequency were used as the cut off (Hamilton & White, 2010). The five most common disadvantages (e.g., sustain vehicle damage) and the three most common advantages (e.g., save time) were used to assess behavioural beliefs in the Main Study.

Participants were then asked to list any individuals or groups who would approve or disapprove of them driving through the flooded waterway in each scenario. The six most frequently identified individuals/groups (e.g., friends, partner) were used as measures of normative beliefs in the Main Study. Participants were requested to identify factors or circumstances that might encourage or discourage them to drive through the flooded waterway in each scenario. The five most frequently reported responses encouraging (e.g., save time) and the three most frequently reported responses preventing (e.g., presence of signage) them to drive through a flooded waterway in each scenario constructed the control belief measures in the Main Study. Refer to Table 1 for the full listing of beliefs elicited in the Pilot Study.

2.3 Phase 2: Main Study

2.3.1 Participants

One hundred and seventy four Australian individuals ranging in age from 17 to 65 years (M_{age} =27.43 *SD* = 10.76) participated in the study. Participant recruitment consisted of convenience sampling using online advertising (e.g., Facebook, emails), face-to-face (e.g., university campuses), and snowball methods. As an incentive to participate, participants were given the option to enter a prize draw to win one of five AUD$20 department store gift vouchers. Additionally, first year undergraduate psychology students could receive course credit for their participation. The majority of participants reported coming from an English speaking background (*n* = 158, 90.8%), being in paid employment (*n* = 127, 73%), and not having any children (*n* = 124, 71.3%). Over half of the participants reported being in a partnered relationship (*n* = 99, 56.9%) and holding a current unrestricted drivers license (*n* = 100, 57.5%).

2.3.2 Measures

The main questionnaire assessed the standard TPB predictors (attitudes, subjective norm, perceived behavioural control, and willingness), along with the indirect TPB predictors (i.e., the underlying beliefs of attitude, subjective norm, and perceived behavioural control namely behavioural, normative, and control beliefs, respectively) which are the focus of this paper. The items measuring the belief-based TPB constructs were formulated to relate to driving through a flooded waterway in the two risk situations. The majority of the items were positively worded, with some reverse-scaled items included to reduce response bias. Items were scored on a 7-point Likert scale. Two items assessed the strength of willingness to implement the target behaviours (e.g., "In general I would be willing to drive through the flooded waterway in this situation", scored *strongly disagree* [1] to *strongly agree* [7]). These two items were added and averaged to produce a composite scale with a significant correlation for the 20cm scenario, $r(170) = .75$, $p < .001$, and the 60cm scenario, $r(164) = .81$, $p <$

.001. Behavioural beliefs were assessed through eight salient behavioural beliefs derived from the pilot study. Participants were asked to state how likely the three benefits (e.g., reach their destination) and the five costs (e.g., encounter hidden hazards) would result if they performed the target behaviour in each scenario. Responses ranged from *extremely unlikely* [1] to *extremely likely* [7]. Normative beliefs were measured by the seven predefined referents identified in the pilot study. Participants were asked to rate how likely the seven referents (e.g., partner, other family members) would approve of them driving through the flooded waterway in each scenario. Responses ranged from *extremely unlikely* [1] to *extremely likely* [7]. Control beliefs, were assessed by the five facilitators (e.g., laziness) and three inhibitors (e.g., speed of water) obtained from the elicitation study. Participants rated how likely it was that these factors would prevent them from driving through a flooded waterway in each scenario, scored *extremely unlikely* [1] to *extremely likely* [7].

2.3.3 Design and procedure

A cross-sectional study involving a correlational design was adopted to identify drivers' beliefs underpinning their willingness to drive through a flooded waterway. Ethical clearance was granted by the University Human Research Ethics Committee (Reference #: PSY/B5/12/HREC). Participants completed a self-report questionnaire either online (n = 142, 72.8%) or paper-based (n = 53, 27.2%), and surveys were counterbalanced to avoid order effects for the two scenarios. Bivariate analyses with Bonferroni adjustment of the study variables across the methods of questionnaire delivery as well as order of scenario delivery revealed no substantive differences. Prior to involvement, all participants were given an information sheet containing details of the study and informed consent was acknowledged through the completion and return of the questionnaire. Gift vouchers were drawn on completion of the study and all participants were given the option to receive a summary of the research findings if requested.

3. Results

3.1 Data analysis overview

To ascertain the key beliefs that guide individuals' willingness to drive through flooded waterways, similar procedures as outlined by von Haeften, Fishbein, Kasprzyk and Montano (2001) and utilised in a number of TPB belief-based studies (e.g., Spinks & Hamilton, 2015; Epton et al., 2014; French & Cooke, 2012), were employed. First, to identify the beliefs that are significantly correlated with individuals' willingness, the Pearson correlation matrix was analyzed. Second, to determine the key beliefs that make significant, independent contributions to willingness within each belief-based measure significant beliefs were entered in a multiple

regression analysis. Significance level was set at $p<.05$ and all analyses were carried out using the statistical software SPSS version 21.

3.2 Key belief analysis

As shown in Table 1, bivariate correlations revealed that for both scenarios, all of the behavioural beliefs and five of six normative beliefs to be significantly correlated with willingness (r = .41 to .72 [20cm scenario], r = .34 to .70 [60cm scenario]). For the control beliefs, four out of eight for the 20cm scenario (r = .16 to .38) and two out of eight for the 60cm scenario (r = .16 to .17) were significantly correlated with willingness.

3.2.1 20cm scenario. Multiple regression analysis for the 20cm scenario revealed those more willing to drive through a flooded waterway were more likely to hold a belief that driving through flood waters would have the outcome of 'reach my destination'; friends, other family members, and police would approve of the behaviour; and a 'small distance of water to drive through' and 'presence of signage' would not prevent them from doing so. Regression analysis also showed those less willing to drive through a flooded waterway were more likely to hold a belief that engaging in the behaviour would result in 'sustain vehicle damage' and 'be swept away'. Refer to Table 2.

3.2.2 60cm scenario. Multiple regression analysis for the 60cm scenario revealed those more willing to drive through a flooded waterway were more likely to hold a belief that driving through flood waters would have the outcome of 'reach my destination'; other family members and 'partner' would approve of the behaviour; and a 'small distance of water to drive through' would not prevent them from doing so. Regression analysis also showed those less willing to drive through a flooded waterway were more likely to hold a belief that engaging in the behaviour would result in 'encounter hidden hazards' and 'become stuck/stranded'. Refer to Table 2.

4. Discussion

The aim of the current study was to determine key salient behavioural, normative, and control beliefs that guide individuals' willingness to drive through flooded waterways, and in doing so, address a significant knowledge gap in the current literature on driving behaviours during floods. Results revealed a range of beliefs as making independent contributions to people's willingness to engage in this risky driving behaviour.

4.1 Key beliefs of people's willingness to drive through flooded waterways

In examining the behavioural beliefs, when deciding to drive through a flooded waterway people assess both the positive (reach their destination) and negative outcomes (sustain vehicle damage, be swept away, encounter hidden hazards, become stuck or stranded) of their potential future action. Although it should be

noted that more behavioural costs than benefits were elicited, indicating people may more readily access negative over positive outcomes in weighing up their willingness to engage in this risky driving behaviour. The fact that people believe they will reach their destination is salient across both the high and low risk scenarios suggests further that this belief may be particularly important to target when developing interventions. Specifically, challenging drivers to consider whether potentially reaching their destination outweighs the risks concerned with driving through flood water could be useful. Furthermore, and in line with other research on driving behaviour (Nelson et al., 2009; Zhou et al., 2009), the results of the current study suggest that in low-risk situations attention is focused on judgments of material (i.e., sustain vehicle damage) as well as personal damage (i.e., be swept away), and if a person believes they will not experience these negative consequences. Whereas in the high-risk scenario, attention is directed more towards the self (i.e., encounter hidden hazards, become stuck/stranded), suggesting that in high-risk situations evaluations about beliefs concerning the individual are more salient.

Social influence also emerged as important in determining individuals' willingness to drive through flood waters. In examining the normative beliefs, other family members appeared to be a salient influence across both risk scenarios, with friend and partner influence emerging as important in a low and high risk context, respectively. These findings are in line with previous research and suggest it is proximal rather than distal (e.g., State Emergency Service) people that exert the most influence on individuals' decisions to drive through flooded waterways (Scott-Parker et al., 2012). In addition, the more people believe that the police approve of them driving through flooded waterways, the more pressure they feel to enact the behaviour. It should be noted, however, that the mean perceived levels of approval were low. Although police may have some influence over willingness to drive through a low-risk flooded waterway, the majority of the sample view police as disapproving of the target behaviour, which may act as a deterrent (Scott-Parker et al., 2012). Similarly, in the high-risk scenario, the more people believe that other members of their family and their partner approve of them driving through the flooded waterway, the more pressure they feel to perform the target behaviour. Although these significant key beliefs correlated positively with willingness, the mean perceived levels of approval were again low for both other family members and partner. Given the limited understanding of the influence of others on driving decisions during floods, further research is thus needed to better understand the effect of normative influences on people's decisions to drive through flooded waterways.

Finally, findings regarding control beliefs provide important information about facilitators and barriers that may help understand this risky driving behaviour. The results suggest that when people perceive there to be

only a small distance of water to drive through, they believe themselves to be capable of driving through the flooded waterway. Targeting this belief, therefore, may prove useful in challenging people's perceptions of their confidence in this context. In the 20cm scenario, the presence of signage may also influence people's willingness to drive through the flooded waterway and, thus, increasing the salience of this belief may be an additional effective intervention strategy to consider in water safety campaigns.

4.2. Theoretical and Practical Implications

The findings of the current study have a number of theoretical and practical implications for the development of strategies to reduce the incidence of driving through flooded waterways. In terms of theoretical importance, the current study adopted a sound theoretical approach to elicit key beliefs that can be used to aid the development of safety messages for risky driving behaviour during floods. Although the TPB has been employed to evaluate interventions (Hardeman et al., 2002), it has rarely been used to guide theoretical interventions (Ajzen, 2015). In terms of practical implications and impact, the current study targeted priority water-safety behaviour of national and international importance that can potentially save lives by combating drownings from risky transport-related aquatic activities, a key strategy in the Australian Water Safety Strategy 2012-2015 (Australian Water Safety Council, 2012). In line with Ajzen (2002), who suggested that the content for TPB-based interventions is founded on underlying behavioural, normative, and control beliefs, the current findings identify a number of beliefs that can be used to reduce people's willingness to drive through flood waters. First, providing information about consequences of the behaviour may prove useful in changing people's attitudes. In particular, interventions could aim to encourage people to contemplate whether the potential risks of the behaviour (e.g., becoming stuck/stranded, be swept away) outweigh the positive outcome of reaching their destination safely. Caution, however, needs to be taken when attempting to increase the awareness of negative behavioural consequences. Research on fear appeals and threatening messages in regards to road safety behaviour appears inconclusive and research suggests that positive emotional appeals may be more successful in changing behaviour (Lewis et al., 2007). Considering risk beliefs, such crashing or avoiding injury/death, did not emerge as significant in either risk scenario, emphasizing the positive outcomes of not driving through flooded waterways (e.g., not being swept away) may be justified. Highlighting the positives of safe driving behaviour has produced successful results in reducing risky driving behaviour (Sibley & Harre, 2009).

The findings suggest the use of strategies that provide normative information about social pressure to engage in this driving behaviour may also be useful. Specifically, the current findings indicate the expectations of proximal rather than distal referent groups may have more influence over people's willingness to drive

through flooded waterways. To reduce this behaviour, one strategy that has been successfully used is the consideration of others' disapproval to reduce risky driving behaviour (Parker et al., 1996). Additionally, using positively framed messages could be effective. For example, conveying closer significant others as approving of peoples' decisions when they choose to take an alternate route (Sibley and Harre, 2009). Finally, interventions focusing on reducing peoples' control beliefs about driving through flooded waterways could be an effective strategy to curb the target behaviour; perhaps by providing people with information that challenges their beliefs in their ability to successfully undertake the behaviour. For example, highlighting that, although it may be perceived to be safe to drive through a small distance of water, the potential risks involved in doing so can be great. However, as suggested previously, careful consideration must be taken when providing people with risk-information as they should not elicit too much emotion so as to polarize peoples' views into strong acceptance or rejection of the message (Tay and Watson, 2002). Alternatively, positively reinforcing peoples' beliefs about their confidence in this context may prove helpful. Strategies that increase individuals' control over their ability to avoid situations that involve the target behaviour could be another valuable technique to discourage people from driving through flooded waterways (Elliot and Thomson, 2010; Luszczynska et al., 2007).

4.3. Strengths, limitations, and future directions

The current study is important as it investigated a risky driving behaviour that to date has received limitation attention in the empirical literature, and adopted a systematic, theoretical approach to identify key beliefs that can be used to inform future campaigns about safe driving behaviour during floods. The current study, however, also has limitations. The sample was predominantly Caucasian and living in a developed country in Queensland, Australia, thus limiting generalizability of the findings. Although the geographical location where the data was collected is prone to flooding and many individuals may therefore be exposed to flooded roads, it would be useful for future research to continue investigations across different communities and differentiated demographic subgroups of drivers in terms of behavioural, normative, and control beliefs to determine if diverse or country specific views emerge.

A further limitation was the use of self-report measures which may be susceptible to social desirability bias particularly when investigating socially undesirable behaviours (Beck & Ajzen, 1991), although the TPB is suggested to be a good predictor of both actual and self-reported behaviour (Armitage & Conner, 2001). Nevertheless, the use of objective behaviour measures in future research, such as observation cameras, may be useful to consider to provide a better understanding of people's behaviour in this context. In addition, future research into this risky driving behaviour should consider the role of past behaviour and the effect of previous

experiences, both positive and negative, of driving through flooded waterways on people's decisions in this context. Finally, the current study employed a measure of willingness, which refocuses some of the responsibility for the behaviour from the individual to the context (Gibbons, Gerrard, Ouellette, et al., 1998). As a result, this study may have been less affected by social desirability constraints that are usually present in the more 'traditional' measures of intentions (Gibbons, Gerrard, Blanton, et al., 1998).

4.3. Conclusion

Overall, the current study provides one of the first examinations of the beliefs that underpin people's willingness to drive through flooded waterways. The findings of the current study highlight the importance of an approach that incorporates attitudinal, normative, and control influences when designing programs to curb this risky driving behaviour. The results, however, should be considered in light of the study's limitations including the use of self report data and the sample being predominantly Caucasian and living in Queensland, Australia – an area prone to floods. Nevertheless, the study provides some useful insights that future interventions could consider in campaigns to reduce the incidence of people driving through flooded waterways. In particular, incorporating attitudinal change strategies, highlighting the social disapproval of others for the behaviour, and challenging people's beliefs about their ability for performing the behaviour as well as positively reinforcing self-efficacy beliefs that people can avoid the behaviour, may be effective strategies to curb this risky and potentially life threatening driving behaviour. Human lives are lost each year as a result of driving through flooded waterways; thus, continued efforts to understand better this behaviour is needed, which in turn, will ultimately help to save lives.

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Table 1 *Means and Standard Deviations of Individual Behavioural, Normative, and Control Beliefs, and Correlations with Willingness for the 20cm Scenario and 60cm Scenario*

	M (20cm)	SD (20cm)	r (20 cm)	M (60cm)	SD (60cm)	r (60cm)
Behavioural Beliefs						
Benefits:						
Save time	4.65	1.73	.41***	3.60	2.05	.34***
Reach my destination	5.07	1.59	.53***	3.37	1.78	.54***
Avoid injury or death	4.64	1.80	.52***	3.60	1.72	.20*
Costs:						
Become stuck/stranded	3.71	1.86	-.68***	5.80	1.32	-.57***
Crash	3.30	1.77	-.57***	4.88	1.74	-.40***
Sustain vehicle damage	4.07	1.85	-.69***	5.88	1.21	-.50***
Be swept away	3.68	1.92	-.69***	5.60	1.35	-.47***
Encounter hidden hazards	4.84	1.62	-.51***	5.98	1.08	-.57***
Normative Beliefs						
Friends	4.02	2.01	.69***	2.24	1.59	.55***
Other family members	3.35	1.89	.72***	1.58	.99	.70***
Partner	3.34	1.99	.65***	1.73	1.31	.59***
Police	2.07	1.40	.53***	1.24	.79	.38***
State Emergency Service (SES)	2.01	1.41	.50***	1.21	.76	.34***
Thrill seekers	5.97	1.68	.14	5.49	1.90	.09
Control Beliefs						
Small distance of water to drive through	2.87	1.84	-.38***	3.94	2.06	-.17*
Seeing others do it	2.82	1.80	-.29***	3.69	1.95	-.15
Presence of signage	4.96	1.96	-.28***	5.55	1.79	-.16*
Laziness	3.20	1.63	-.12	3.66	1.88	-.01

Save time	3.30	1.70	-.14	3.77	1.96	-.07
Speed of water	5.57	1.69	-.16*	6.01	1.65	-.10
Rising water	5.74	1.58	-.12	6.11	1.61	-.08
Emergency situation	4.84	2.13	-.13	5.26	2.12	-.02

*** $p < .001$; ** $p < .01$, * $p < .05$

Table 2

Summary of the Multiple Regression Analyses Identifying the Key Beliefs to Reduce Individuals' Driving Through Flooded Waterways

	β	sr^2	R^2	df	F
20cm scenario					
Behavioural beliefs			.58	3, 164	75.47***
Sustain vehicle damage	-.37***	.04			
Reach my destination	.26***	.05			
Be swept away	-.26**	.02			
Normative beliefs			.57	3, 160	71.95***
Friends	.32***	.05			
Other family members	.35**	.03			
Police	.19**	.02			
Control beliefs			.19	2, 166	19.64***
Small distance of water to drive through	-.34***	.11			
Presence of signage	-.21**	.04			
60cm scenario					
Behavioural beliefs			.47	3, 151	44.41***
Encounter hidden hazards	-.29***	.04			
Become stuck/stranded	-.26**	.04			
Reach my destination	.27***	.05			
Normative beliefs			.52	2, 157	84.48***
Other family members	.55***	.17			
Partner	.23**	.03			
Control beliefs			.03	1, 162	4.54*
Small distance of water to drive through	-.17*	.03			

*** $p < .001$; ** $p < .01$, * $p < .05$