Changing people's attitudes and beliefs toward driving through floodwaters: evaluation of a video infographic

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Citation: Hamilton, K., Peden, A., Keech, J., & Hagger, M. S. (2018). Changing people's attitudes and beliefs toward driving through floodwaters: Evaluation of a video infographic. *Transportation Research Part F: Traffic Psychology and Behaviour, 53,* 50-60. https://doi.org/10.1016/j.trf.2017.12.012

Abstract

Despite awareness of campaigns such as 'Turn Around, Don't Drown' and the Australian state of Queensland's 'If It's Flooded, Forget It', people continue to drive through floodwaters, causing loss of life, risk to rescuers, and damage to vehicles. The aim of this study was to develop a video infographic that highlights the dangers of driving through floodwaters and provide safety tips to reduce the risk, and to evaluate its effectiveness in changing the beliefs and intentions of men and women toward this risky driving behaviour. This study adopted an online a three-wave non-controlled pretest-posttest design. Australian licensed drivers (N = 201, male = 41, female = 160; M_{age} = 34.10) self-reported their demographic and psychological variables (intention, attitude, subjective norm, barrier self-efficacy, risk perception, anticipated regret, perceived susceptibility, and perceived severity) at baseline (T1), immediately post-intervention (T2), and at a one-month follow-up (T3). Messages in the video infographic were developed based on psychological theory and empirical evidence, using data on causal factors derived from coronial records and the findings of behavioural research. Results indicated that men had significantly higher intentions and attitudes and significantly lower barrier self-efficacy, risk perception, anticipated regret, perceived susceptibility, and perceived severity with respect to driving through floodwater than women. Statistically significant time x gender interaction effects were also found; attitude and subjective norm were significantly lower between T1 and T2 for both men and women but scores between T2 and T3 remained significantly lower for women only. In addition, perceived susceptibility and perceived severity scores were significantly higher in women across T1 and T2, with the difference maintained at T3. In contrast, there were no differences in scores across the three-time points for men. The implications of these findings for road safety and drowning prevention messages targeting drivers during floods are discussed.

Keywords: Flooded waterways; social cognitive theories; driving; beliefs; drowning, water safety

Highlights

- Drowning due to driving through floodwater continues despite current public awareness campaigns.
- Persuasive communications may influence drivers' decisions to drive through floodwater.
- Messages changed attitude and subjective norms of men and women.
- Only changes in beliefs of women were maintained over time.
- More research on the long-term effects of persuasive communications on drivers' behaviour is required.

1 Introduction

Globally, drowning accounts for 7% of all injury-related deaths making it the third leading cause of unintentional death worldwide (WHO, 2014). In Australia, on average over 280 people die each year as a result of unintentional drowning (RLSSA, 2016), with non-fatal drowning thought to be at least 20-50 times the rate of drowning (Onyekwelu, 2008). Men continue to be at a higher risk of drowning, with double the overall mortality rate of women

globally (WHO, 2014). Of the 280 unintentional drowning fatalities in Australia last year, 83% were men (RLSSA, 2016). The economic impact of drowning is substantial; the total annual cost of drowning injury in Australia is about AUD110 million with similar rates per capita reported in other developed countries (WHO, 2014). To highlight the seriousness of this issue, reports suggest that drowning represents a similar burden today as diarrhoeal disease and measles in the 1970s and 1980s (WHO, 2014).

There is a strong association between individuals' behaviour during floods and risk of drowning. One of the more prominent behavioural risk factors related to flood drowning fatalities is intentional driving through floodwater, with reports indicating that around 53% of flood-related deaths were the result of this risky behaviour, and male and female fatality rates for this particular drowning-related behaviour are approximately 60% and 40%, respectively (AWSC, 2016; Peden, Franklin, Leggat, & Aitken, 2017; WHO, 2014). Thousands more are rescued every year on the roads, many underestimating the depth and velocity of the water, believing their vehicles to be large enough to drive through or perceiving pressure from passengers and/or a need to go to work or get home (Hamilton, Peden, Pearson, & Hagger, 2016). These facts make driving behaviour and drowning a serious public health issue, and it is recommended by the World Health Organization (WHO, 2014) in their first-ever global report on drowning, that prevention is vital to combat drowning rates. The Australian Water Safety Council (AWSC, 2016) has established the goal of achieving a 50% reduction in drowning deaths by the year 2020. Consistent with this goal, the Australian Water Safety Strategy 2016-2020 has targeted reducing the impact of disaster and extreme weather on drowning deaths – with driving through floodwaters identified as a priority area. Key objectives in achieving these aims are to implement strategies that raise community awareness of water safety, and promote better education and skills to prevent drowning from these activities.

Mass media campaigns have aimed to address the problem of flood-related drownings, such as 'Turn Around Don't Drown' (NOAA, 2011) and 'If it's flooded, forget it' (Queensland

Floods Commission of Inquiry, 2012) - government initiatives specifically targeting driving through floodwaters. 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, motives, and, critically, actual drowning rates. In fact, in Australia, fatal and non-fatal incidents continue to occur regularly (AWSC, 2016; Henley & Kreisfield, 2008; Peden, Franklin, & Leggat, 2016; RLSSA, 2016), with an average of 13 river flood-related fatalities each year (Peden et al., 2017). This suggests current water-safety messages are not effective, or insufficient, in encouraging people's safe behaviours in floods and has resulted in a national call for research into behaviours around floodwater (AWSC, 2016).

Although mechanisms exist which can help to understand why individuals may decide to engage in safety compromising behaviours around water (Drobot, Benight, & Gruntfest, 2007; Gissing, Haynes, Coates, & Keys, 2016; Hamilton, Peden, et al., 2016; Hamilton & Schmidt, 2013, 2014; Hamilton, White, Wihardjo, & Hyde, 2016; Pearson & Hamilton, 2014; Taylor, 2016), the empirical literature to guide health and safety messages is lacking. Mass media campaigns can produce positive changes or prevent negative changes in health-related behaviours across large populations (Wakefield, Loken, & Hornik, 2010). Theory-based campaigns are also more effective in promoting health-protective behaviour compared to atheoretical campaigns (Noar, 2006; Webb, Joseph, Yardley, & Michie, 2010).

Further, evaluation of advertising countermeasures is easier and more cost effective with theoretically devised approaches given the clearly measurable constructs (French et al., 2012; Prestwich, Webb, & Conner, 2015; Stead, Tagg, MacKintosh, & Eadie, 2005). However, although theory-based campaigns has been suggested as one of the more critical conditions for the success of most public health media campaigns, it is often overlooked (Nathanail & Adamos, 2013; Randolph & Viswanath, 2004). Given psychological factors are likely to be critical in individuals' decisions to drive through floodwater, it is important that behavioural

interventions grounded in sound psychological theory are adopted to modify people's risky behaviours around water.

The Current Study

Drawing on our previous research (citations removed for peer-review), we identified key theory-based constructs (beliefs, attitudes, self-efficacy, risk perceptions, and regret) and mapped these on to relevant behaviour change methods (see Kok et al., 2016), to develop an empirical- and theory-based video infographic designed to highlight the dangers of driving through floodwaters and provide safety tips to reduce the risk. The aim of this study was to determine whether the infographic would have a direct impact on the beliefs and intentions of men and women toward driving through floodwater. Although drowning rates as a result of driving through floodwater are higher for men (approx. 60%), rates of drowning deaths as a result of this risky driving behaviour are still high among women (approx. 40%), thus warranting investigation of both sexes in this context (Peden et al., 2017). However, as overall drowning rates are substantially higher for men, and men are more likely to drive through floodwater leading to increased incidents that may necessitate attendance of emergency services and, hence, incur greater service provision costs, we aimed to test gender differences in the effects of the infographic over the course of the intervention. Accordingly, the objectives of this study were to: (a) determine whether the infographic viewed at Time 1 (T1) would change drivers' beliefs and intentions immediately post exposure at Time 2 (T2); (b) determine whether any immediate effects of the infographic were maintained 4 weeks later at Time 3 (T3); and, (c) examine differences in beliefs between men and women at all time points.

We predicted that the infographic would lead to lower reported intentions, less favourable attitudes, and reduced perceived social pressure to drive through floodwater as well as greater perceptions of barrier self-efficacy to avoid driving through floodwater and greater levels of risk perception, perceived susceptibility, perceived severity, and anticipated regret toward driving through floodwater between T1 and T2 (Hypothesis 1). This is because growing

evidence has shown that fear-inducing appeals, such as those presented in the infographic, to have strongest effects on belief and intention change immediately after exposure (Lewis, Watson, & White, 2008). We also explored whether changes in beliefs and intentions as a result of exposure to the infographic were maintained at T3 (Hypothesis 2). Although effects of fear appeals tend to wane very quickly, when coupled with clear instructions aimed at fostering self-efficacy to engage in specific coping behaviours, fear appeals are effective in changing beliefs over time (Peters, Ruiter, & Kok, 2013). As the current infographic did not only focus on fear-inducing messages, but also included clear-stated messages of specific behaviours to prevent the negative outcomes of driving through floodwaters, we expected the infographic to deliver longer-term changes in beliefs and intentions. There is also precedent for long-term belief change based on messages aimed at inducing changes in self-efficacy over time in health behaviour contexts (Luszczynska et al., 2016).

In addition, we expected gender differences to emerge. Specifically, given more men compared to women drive through floodwater (Peden et al., 2017), at baseline we expected men compared to women to report higher intentions, more favourable attitudes, and greater perceived social pressure to drive through floodwater as well as lower perceptions of barrier self-efficacy to avoid driving through floodwater, and lower levels of risk perception, perceived susceptibility, perceived severity, and anticipated regret toward driving through floodwater (Hypothesis 3). Further, we expected to find statistically significant time x gender interaction effects such that the effects of exposure to the infographic on belief and intention change would be greater in women compared to men (Hypothesis 4). This is because women are more likely to respond to, and have higher intentions toward, activities that improve their health (Keller & Lehmann, 2008), and that public health campaigns using fear and threat appeals have been shown to be more effective in women (Goldenbeld, Twisk, & Houwing, 2008; Lewis, Watson, & Tay, 2007).

2 Method

2.1 Participants

A non-random convenience sample of Australian licensed drivers (N = 242) was recruited via email notices and social media advertisement. Participants ranged in age from 17 to 77 years and years of licensed driving experience ranged from 1 to 61 years. As an incentive for participation, drivers who completed all parts of the study were provided with the option of entering a prize draw for the chance to win one of three department store vouchers valued at AUD50. Our sampling frame aimed to recruit a gender-balanced sample. It was, however, clear during the course of recruitment that males were underrepresented in the respondents. While we attempted to correct this bias by proactively targeting males (e.g., targeting social media groups with predominately male membership and utilising recruitment messages that specifically requested male participants), we were not able to recruit sufficient males to produce a gender-balanced sample.

Sample demographic characteristics are presented in Table 1. Of the participants that agreed to participate (N = 242, males, n = 49; females, n = 191, ineligible, n = 2), 39 were unavailable to provide follow-up data at T3 (attrition rate = 16.25%). Two participants reported having seen the video infographic previously, one of whom provided follow up data. Data from these participants were omitted from the final analysis. This left a final sample of 201 (males, n = 41; females, n = 160; M_{age} = 34.10, SD = 12.91). Attrition analyses indicated no significant differences in the age ($F(1,238) = 0.72$, $p = .397$), number of years driving ($F(1,238) = 1.22$, $p = .271$), number of children ($F(1,238) = 0.02$, $p = .876$), and past frequency of driving through floodwaters ($F(1,238) = 0.78$, $p = .379$) of participants that remained in the study at T3 follow-up and those that dropped out at T2 post-intervention. Attrition analyses also revealed no differences in gender distribution ($\chi^2 < 0.01$, $p = .987$) and relationship status ($\chi^2 = 0.04$, $p = .839$) between the T2 sample and the T3 post-intervention sample. However, a slightly higher proportion of participants who remained in the study at T3 had completed high school

education (86.74%) relative to those who dropped out (74.58%) at T2, a difference that was statistically significant ($\chi^2 = 4.84$, $p = .028$).

[Insert Table 1 here]

2.2 Design and Procedure

The current study adopted a three-wave non-controlled pretest-posttest design. The University Human Research Ethics Committee approved the study (ref no: 2016/453) and data were collected between June 2016 and September 2016. The study was administered online using Qualtrics© research software. At T1 (baseline), participants completed a questionnaire assessing demographic characteristics, psychological measures, and past frequency of driving through floodwater. After completing the T1 questionnaire, all participants were shown the video infographic, after which they were asked to complete the T2 (immediate follow-up post-intervention) questionnaire comprising the same psychological measures from T1. Participants were automatically emailed with an invitation to complete the T3 (one-month follow-up post-intervention) questionnaire four-weeks following completion of T2. The T3 questionnaire comprised the same psychological measures as T1 and T2. Data across each time point were able to be de-identified and matched using a unique code identifier created by the participant.

2.3 Intervention

All participants were presented with a video infographic entitled “For Life’s Sake”, which was designed to educate the community on the risks, consequences, and social impacts of driving through floodwater, while providing key safety actions to reduce fatal and non-fatal drowning. Messages in the infographic were developed based on psychological theory and empirical evidence, using data on causal factors derived from coronial records of people who drowned whilst driving through floodwater and the findings of behavioural research. The infographic is 2 minutes, 11 seconds in duration, and uses a mixture of animation and still images. The concept and storyboard was developed in collaboration with industry and university experts [blinded for review], and a professional animation company was engaged to

produce the final content including voice overs and background music. The infographic was pilot tested by two industry experts in the field of drowning prevention.

The infographic used specific methods of behaviour change (see Kok et al., 2016) that mapped onto key theory-based constructs identified in our previous research (attitudes, risk perceptions, perceived severity, perceived susceptibility, anticipated regret, self-efficacy, subjective norms). Specifically, the infographic provides information on the consequences of the behaviour (method to change attitudes), prompts/raises personal risk (method to change risk perception, perceived severity, and perceived susceptibility), emphasises personal susceptibility to negative consequences of behaviour (method to change risk perception, perceived severity, perceived susceptibility, and anticipated regret), provides instruction and prompts barrier identification and planning in relation to anticipated barriers (method to increase self-efficacy), and provides information about others' behaviour (method to change subjective norms). Refer to Table 2 and the video "For Life's Sake" to view the infographic.

[Insert Table 2 here]

[https://www.youtube.com/watch?v=ZtlXpDBjU1Q&t=5s]

2.4 Measures

2.4.1 Psychological measures. The psychological constructs were measured on multi-item psychometric instruments developed using standardised guidelines (e.g., Ajzen, 2006) and used in previous studies and adapted for the target behaviour in the current study (Abraham & Sheeran, 2003; Hamilton & Schmidt, 2014; McCool, Ameratunga, Moran, & Robinson, 2009; Pearson & Hamilton, 2014). The self-report psychological measures were delivered at T1, T2 and T3, and were preceded by the following statement: "The following questions will ask about your knowledge and attitudes toward driving through floodwater. "Floodwater" refers to a body of water covering land that is normally dry. For the next questions, please think about your driving through floodwater. For example, think about the scenario where you are driving in your car immediately after a thunderstorm. You approach a

section of the road that is completely covered in water. Now consider your future driving, if such a scenario occurred, how likely are you in the future to drive through the floodwater…?"

2.4.1.1 Intention. Intention toward driving through floodwater was measured using four items (e.g., "I intend to drive through the floodwater", scored 1 (*strongly disagree*) to 7 (*strongly agree*); T1, α = .89; T2, α = .93; T3, α = .90).

2.4.1.2 Attitude. Attitude towards driving through floodwater were assessed using five semantic differential items (e.g., "If I were to drive through the floodwater, it would be... *bad – good*", scored 1 to 7); T1, α = .86; T2, α = .81; T3, α = .91).

2.4.1.3 Subjective norm. Subjective norm was measured using five items assessing how important others in their life would want them to drive through floodwater and whether people similar to them would drive through (e.g., "Most people who are important to me would approve of me driving through the floodwater", scored 1 (*strongly disagree*) to 7 (*strongly agree*); T1, α = .90; T2, α = .90; T3, α = .87).

2.4.1.4 Barrier self-efficacy. Barrier self-efficacy was measured using nine items assessing confidence that one can avoid driving through floodwater (e.g., "I am confident I can avoid driving through floodwaters in the future… even when the alternative route will take more time/is inconvenient", scored 1 (*not at all confident*) to 7 (*definitely confident*); T1, α = .95; T2, α = .98; T3 α = .97).

2.4.1.5 Risk perception. Risk perception was measured using a two-item scale (e.g., "It would be risky for me to drive through the floodwater", scored 1 (*strongly disagree*) to 7 (*strongly agree*); T1, α = .76; T2, α = .93; T3, α = .76).

2.4.1.6 Anticipated regret. Anticipated regret was measured using a three-item scale (e.g., "If I were to drive through the floodwater, I would feel regret", scored 1 (*strongly disagree*) to 7 (*strongly agree*); T1, α = .96; T2, α = .97; T3, α = .96).

2.4.1.7 Perceived susceptibility. Perceived susceptibility was measured using a three-item scale (e.g., "My chances of having trouble if I drive through the floodwater are great",

scored 1 (*extremely unsusceptible*) to 7 (*extremely susceptible*); T1, α = .94, T2, α = .98; T3, α = .96).

2.4.1.8 Perceived severity. Perceived severity was measured using a two-item scale (e.g., "If I drive through the floodwater, the consequences would be…", scored 1 (*not at all severe*) to 7 (*extremely severe*); T1, α = .86; T2, α = .91, T3, α = .90).

2.4.2 Demographic and other background factors. Background details were collected at T1 including: (i) age (in years); (ii) relationship status (coded as 0 = *not married* and 1 = *married*; (iii) education level (coded as 0 = *non-university* and 1 = *university*; (iv) number of years driving; (v) number of children; and (vi) past frequency of driving through floodwater (measured using a single item "How often in the past 5 years have you driven through floodwater? 'Floodwater' refers to a body of water covering land that is normally dry", scored 1 (*never*) to 7 (*very often*).

2.5 Data Analysis

Data were analysed using the SPSS v.22 data analysis software. We tested our main hypotheses of the effects of the infographic intervention using a series of mixed-model ANCOVAs. In the analyses, the intervention was represented by the within-participants independent variable of time (T1, T2, T3), gender as a between-participants independent variable, and the psychological variables (intention, attitude, subjective norm, barrier self-efficacy, risk perception, anticipated regret, perceived susceptibility, and perceived severity) as separate dependent variables. As we conducted separate analyses for each dependent variable, we adjusted the criterion alpha level to .01 to protect from type 1 errors. Demographic variables (age, relationship status, educational level, number of years driving, number of children, and past frequency of driving through floodwaters) were included as covariates in the analysis.

3 Results

Means and standard deviations of the study variables at baseline (T1), immediately post-intervention (T2), and at one-month follow-up (T3) by gender are presented in Table 3. Univariate analyses indicated a gender difference in past frequency of driving through floodwaters with men (M = 2.60, SD = 1.43) significantly more likely to do so than women (M = 1.32, SD = 1.07), $t(240) = 2.64$, $p = .009$. Mixed-model ANCOVAs used to test our main hypotheses revealed no main effects of time on the dependent variables in any of the analyses, but we found statistically significant main effects of gender on intention ($F(1, 193) = 13.89$ $p < .001$, $\eta^2_p = .067$), attitude ($F(1, 193) = 16.81$, $p < .001$, $\eta^2_p = .080$), barrier self-efficacy ($F(1, 193) = 10.46$, $p = .001$, $\eta^2_p = .051$), risk perception ($F(1, 193) = 6.76$, $p = .010$, $\eta^2_p = .034$), anticipated regret ($F(1, 193) = 14.17$, $p < .001$, $\eta^2_p = .068$), perceived susceptibility ($F(1, 193) = 13.53$, $p < .001$, $\eta^2_p = .065$), and perceived severity ($F(1, 193) = 13.56$, $p < .001$, $\eta^2_p = .066$). Univariate analyses indicated that within each time point, men reported statistically significantly higher intentions and attitudes toward driving through floodwater, and significantly lower barrier self-efficacy, risk perception, anticipated regret, perceived susceptibility, and perceived severity with respect to driving through floodwater, compared to women. We also found statistically significant time x gender interaction effects on attitude ($F(2, 386) = 5.22$, $p = .006$, $\eta^2_p = .026$), subjective norm ($F(2, 386) = 13.72$, $p < .001$, $\eta^2_p = .066$), perceived susceptibility ($F(2, 386) = 4.48$, $p = .012$, $\eta^2_p = .023$), and perceived severity ($F(2, 386) = 4.75$, $p = .009$, $\eta^2_p = .024$).

[Insert Table 3 here]

Time x gender interaction effects for the attitude, subjective norm, perceived susceptibility, and perceived severity are illustrated in Figures 1 to 4. Probing the interaction effects using univariate follow-up analyses revealed that attitude (see Figure 1) and subjective norm (see Figure 2) were significantly lower between baseline (T1) and immediately post-intervention (T2) for both men (attitude: $t(40) = 2.93$, $p = .006$; subjective norm, $t(40) = 4.76$, p

< .001) and women (attitude: $t(159) = 5.59$, $p < .001$; subjective norm, $t(159) = 5.30$, $p < .001$), but there were no significant differences in scores between T2 and T3, four-weeks later, in men (attitude: $t(40) = -0.65$, $p = .521$; subjective norm, $t(40) = -1.84$, $p = .074$), while scores remained significantly lower for women over the same time frame (attitude: $t(159) = 3.62$, $p < .001$; subjective norm, $t(159) = 2.77$, $p = .006$). In addition, perceived susceptibility (see Figure 3) and perceived severity (see Figure 4) scores were significantly higher in women across T1 and T2 (perceived susceptibility: $t(159) = -6.44$, $p < .001$; perceived severity, $t(159) = -12.11$, $p < .001$), a difference that was maintained at T3 (perceived susceptibility: $t(159) = -3.63$, $p < .001$; perceived severity, $t(159) = -8.14$, $p < .001$), while there were no differences in scores across the three time points for men (t's (40) < 1.94 , p's > .059).

[Insert Figures 1 to 4 here]

4 Discussion

Despite considerable investment in public health campaigns and initiatives aimed at reducing deaths due to driving through floodwater, evaluation of their effects on attitudes, motives and drowning rates is lacking, and many lives continue to be lost each year. The aim of the current study was to develop a video infographic based on psychological theory and empirical evidence to highlight the dangers of driving through floodwaters and provide safety tips to reduce the risk and to evaluate its effectiveness in changing the beliefs and intentions of men and women toward this risky driving behaviour. No main effects of time on the dependent variables in any of the analyses were found; however, results indicated that men compared to women had significantly higher intentions and attitudes and significantly lower barrier self-efficacy, risk perception, anticipated regret, perceived susceptibility, and perceived severity with respect to driving through floodwater. Statistically significant time x gender interaction effects were also found; attitude and subjective norm were significantly lower between T1 and T2 for both men and women but scores between T2 and T3 remained significantly lower only for women. In addition, perceived susceptibility and perceived severity scores were

significantly higher in women across T1 and T2, a difference that was maintained at T3, while there were no differences in scores across the three-time points for men.

A key contribution of the current research is the identification of gender differences in individuals' beliefs toward driving through floodwater. Specifically, and as expected, men exhibited greater beliefs in support of driving through floodwater compared to women. The fact that substantially more men than women die as a result of drowning each year (Peden et al., 2016; RLSSA, 2016; WHO, 2014) supports our findings. Moreover, although the infographic was able to show initial changes in the attitudes and perceptions of social pressure of men toward driving through floodwater, these effects were not maintained. Conversely, these effects, in addition to perceptions of susceptibility and severity, were maintained in women. This suggests that the infographic was more effective in women, which extends previous research demonstrating greater effectiveness of public health campaigns using fear- and threat-based messages in women compared to men (Goldenbeld et al., 2008; Lewis et al., 2007). It is therefore important in moving forward efforts to reduce driving through floodwater that gender differences in public health campaigns continue to be accounted for and acknowledged. In particular, future research should explore how messages aimed at reducing driving through floodwater may require different framing to effectively target both sexes, but especially for men given the increased prevalence of drownings as a result of driving through floodwater in this group (Peden et al., 2017).

Three possible explanations exist for the gender differences found in the current study. First, men had significantly higher past frequency of driving through floodwater compared to women. Endorsing perceptions of susceptibility and severity may induce cognitive dissonance (discomfort felt when holding two conflicting cognitions, usually dealt with by devaluing one cognition; Festinger, 1957) in those that have already engaged in the behaviour, thus devaluing the intervention messages in the time between T2 and T3. While past frequency of driving through floodwater was controlled for in the analyses, the effects of cognitive dissonance are

not necessarily proportional to behavioural frequency. Second, according to theories and models of social cognition (Ajzen, 1991; Bandura, 1986; Schwarzer, 2008), reinforcement is important for maintenance of behaviour change. In general, women tend to utilise ruminative thinking styles to a greater degree than men (Johnson & Whisman, 2013) and may, therefore, be self-reinforcing the messages contained within the intervention. Third, prior research has found that other risky driving behaviour (e.g., speeding) is associated with unconscious priming of masculinity in men (Mast, Sieverding, Esslen, Graber, & Jäncke, 2008). Similarly, Krahé and Fenske (2002) found that macho personality (exaggerated endorsement of masculine style and male stereotypes; Mosher & Sirkin, 1984) predicted aggressive driving behaviour (low regard for road rules and willingness to take risks). The task of increasing perceived susceptibility and risk in men regarding risky driving behaviours may therefore involve a tailored approach to undermining preconceptions about the behaviour being associated with the socially desirable trait of masculinity.

In the current study, it is also important to note that intentions for both men and women were not affected by exposure to the infographic. From the perspective of social cognitive models that assume behaviour is a function of reasoned deliberation over the relative merits and detriments of future courses of action, the current research suggests that the infographic may not be effective in changing behaviour. As intention is the proximal predictor of behaviour in many models, including those that informed the current study, intention change should indicate the propensity of an intervention to change behaviour. Furthermore, in contexts where obtaining a behavioural measure presents considerable challenge, such as for driving through floodwater, intention change should serve as an important indicator of future action. We must therefore acknowledge that the current infographic may not be effective in changing this key behavioural antecedent, and may, therefore, not evoke behaviour change. Going forward, formative work on identifying the key beliefs relating to driving through floodwaters, and constructing interventions directly appealing to these specific beliefs, may increase the

propensity of the intervention to affect change in the specific sets of beliefs relevant to this population (Hamilton, Peden, et al., 2016).

However, it is also important to acknowledge that although intentions are a key antecedent of behaviour, there are numerous examples of direct effects of interventions on behaviour change independent of intention change (Conner, Rhodes, Morris, McEachan, & Lawton, 2011; Hagger, Lonsdale, & Chatzisarantis, 2012). There may be two reasons for this. First, it may be that the messages evoke behaviour change independent of intentions. This would imply behaviour change that is less the result of reasoned, intentional pathways to behaviour and more impulsive, non-conscious processes (e.g., Hamilton, Kirkpatrick, Rebar, & Hagger, 2017; Hollands, Marteau, & Fletcher, 2016). An example would be messages that appeal to changes in emotional or affective attitudes. There is a substantive body of research demonstrating that affective evaluations of action predict behaviour independent of intention (Lawton, Conner, & McEachan, 2009), and that interventions targeting affective beliefs are mediated by changes in affective attitudes and not intentions (Conner et al., 2011). This may have been the case in the current infographic which contained prominent messages aimed at evoking a fear or emotional response. Second, our measure of intentions may not have adequately captured the relevant behaviour of interest. Our measure did not have clear correspondence with the target behaviour; it did not specify a time frame, target, or context as recommended by Ajzen (1991). However, a behaviour such as driving through floodwater presents considerable challenges to the correspondence guidelines. Accordingly, the target behaviour may have been too abstract or unclear to individuals resulting in inconsistency or uncertainty in their intention estimates, adding to error variance. The increased error variance may have been a reason why the infographic failed to predict intentions.

4.1 Study Limitations and Future Directions

This study has the main strengths of using psychological theory and empirical evidence to develop a video infographic about the dangers of driving through floodwater and evaluating

its effectiveness in changing individuals' beliefs and intentions toward this risky driving behaviour in flood; two major criticisms of current public health advertising campaigns. The findings therefore contribute to the cumulative knowledge about the use of water safety campaigns in risk-related behaviour change. Despite these strengths, limitations to the current study should be noted. The adoption of the pretest-postest design without a control or comparison group did not permit to unequivocally conclude that changes from baseline to follow-up were due to the influence of the infographic, nor did it allow us to make inferences regarding cause and effect. Further, as follow-up data was only collected over a short time period (i.e., one month) we do not know if the effects would still hold in the longer term. Current results therefore need to be confirmed using a randomised control trial and over a longer follow-up period.

In addition, the sample varied in age and was predominantly female and Caucasian. While we adopted numerous strategies including oversampling among males, we were unable to recruit a sample that was representative of the target population of car drivers. The inherent bias in the current sample limits the generalisability of the findings and we look to future investigations to test current intervention in samples that are more closely representative of the target population in terms of ethnicity, age, and gender. Investigating effects of water safety messages on men is especially important given this target group is reported to drown at substantially higher rates than women (Peden et al., 2016; RLSSA, 2016; WHO, 2014) and current findings showed limited effects of the infographic on the beliefs of men. Also, due to the unpredictable nature of flood events only intentions to drive through floodwater and not actual behaviour was investigated. The use of objective behaviour measures in future research, such as observation cameras, may be useful to provide a better understanding of the effects of water safety campaigns on individuals' behaviour. For example, similar observation techniques as those used by Gissing et al. (2016) after the widespread floods around the Shoalhaven River, New South Wales, Australia in August 2015 could be used to observe the decision-making of

motorists posed with the choice of whether or not to enter floodwaters to assess the effectiveness of public health messages to avoid driving through floodwater.

Finally, given recent advertisements of other government campaigns about driving through floodwater, it is possible that the changes to individuals' beliefs reported here are conservative, as the effects of road safety advertisements might decline over time (Fry, 1996). As such, repeated cycles of exposure to road safety advertisements is important for maintaining their effects (Wakefield et al., 2010). There is also growing evidence that negative appeals (such as in the infographic being evaluated) are more persuasive immediately after exposure (Lewis et al., 2008), while positive appeals are more persuasive over time. Contrasting with negative and threat-based approaches, recent research highlights that positive emotion-based approaches targeting control beliefs have shown utility for changing speeding behaviours in young male drivers (Lewis, White, Ho, Elliott, & Watson, 2017). This aligns with (Lewis, Watson, White, & Elliott, 2013) findings that young males want to take control of their driving situation. In an effort to improve the long-term effectiveness and ability to influence male driver willingness to drive through floodwater, future research should trial positive emotion-based approaches.

4.2 Conclusion

Despite awareness campaigns such as 'Turn Around, Don't Drown' and the Australian State of Queensland's 'If It's Flooded, Forget It', people continue to drive through floodwaters, causing loss of life, risk to rescuers, and damage to vehicles. In an attempt to change people's driving behaviour during floods, the video infographic and its messages were developed for the current study based on psychological theory and empirical evidence, using data on causal factors derived from coronial reports and the findings of behavioural research. Preliminary findings indicated that the infographic was effective in reducing individuals' positive attitudes and social pressure to drive through floodwaters immediately after viewing the video with some evidence to support that the effects, at least for women, persisted one-month later. Future

research is needed on the long-term impact of driver behaviour when faced with the option of driving through floodwaters, especially in men. The current research is novel and innovative and has the ability to influence the development of more effective drowning prevention public awareness and education messages in the future.

Funding: The study was supported by a Royal Life Saving Society - Australia grant. An NRMA Insurance Community Grant sponsored the production of the video infographic reported in this article. The sponsors had no role in the design, methods, participant recruitment, data collection, analysis, preparation of this manuscript, or the decision to submit this article for publication.

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Table 1

Demographic Data and Descriptive Statistics for Study Variables Across Time Points

Variable	Time 1	Time 2	Time 3
Participants	240	240	201
Gender			
Male	49	49	41
Female	191	191	160
Age, *M* years (SD)	33.81 (12.92)	33.81 (12.92)	34.13 (12.88)
Children			
Yes	95	95	80
No	145	145	121
Education level			
Completed junior school (yr 10) or less	7	7	4
Completed senior school (yr 12)	52	52	40
Vocational Education / Diploma	50	50	42
Undergraduate University degree	66	66	59
Postgraduate University degree	65	65	56
Marital status			
Never married	114	114	96
Married registered	81	81	74
Married defacto	21	21	12
Separated / Divorced	18	18	14
Widowed	6	6	5
Years driving, *M* years (SD)	15.70 (12.43)	15.70 (12.43)	16.09 (12.29)

Table 2

Behaviour Change Methods, Detailed Descriptions, Theoretical Construct Targeted, and Example Content from the Video Infographic for the Intervention to Change Intentions to Drive Through Floodwaters

Behaviour change method	Description	Target construct	Example of infographic content
Provide information on consequences of behaviour	Participants provided with details on the consequences of driving through floodwaters	Attitudes	Presentation of statistics associated with driving through floodwater; Providing information about the uncertainty of conditions when water is covering the road and specific information about the effect of floodwater on vehicles
Prompt/raise personal risk	Highlighting personal risk by demonstrating links between the person and the risky/harmful action	Risk perception, perceived severity, perceived susceptibility	Providing an account of why people drive through floodwater by presenting quotes of people who have driven through floodwaters from prior surveys
Emphasise personal susceptibility to negative consequences of behaviour	Identifying the negative consequences of the behaviour and their relevance to the individual	Risk perception, perceived severity, perceived susceptibility, anticipated regret	Presentation of imagery to demonstrate potential loss of loved ones
Provide instruction; Prompt barrier identification and planning in relation to anticipated barriers	Instruction on how to perform the behaviour; Identify important obstacles and suggest strategies to overcome them	Barrier self-efficacy	Providing tangible strategies to avoid driving through floodwater such as following advice of emergency personnel and signage, making planning, calling family
Provide information about others' behaviour		Subjective norm	Presentation of quotes highlighting the social pressures of others to drive through floodwaters from prior surveys

Table 3
Means and Standard Errors of Study Variables by Time and Gender

Variable	Time 1 (n = 240)				Time 2 (n = 240)				Time 3 (n = 201)			
	Men		Women		Men		Women		Men		Women	
	M	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*
Intention	2.41	0.16	2.00	0.08	2.11	0.15	1.59	0.08	2.66	0.16	1.76	0.08
Attitude	2.26	0.16	1.90	0.08	1.99	0.12	1.50	0.06	2.46	0.16	1.59	0.08
Subjective norm	2.17	0.16	2.00	0.08	1.83	0.14	1.74	0.07	2.53	0.15	1.80	0.07
Barrier self-efficacy	4.92	0.22	5.41	0.11	5.15	0.24	6.08	0.12	5.17	0.24	5.80	0.12
Risk perception	6.04	0.16	6.38	0.08	6.25	0.17	6.50	0.08	6.01	0.14	6.54	0.07
Anticipated regret	4.07	0.24	4.88	0.12	4.60	0.24	5.70	0.12	4.68	0.23	5.44	0.11
Perceived Susceptibility	5.51	0.19	5.86	0.10	5.44	0.18	6.28	0.09	5.45	0.17	6.21	0.09
Perceived Severity	4.50	0.22	4.97	0.11	4.85	0.22	5.84	0.11	4.76	0.20	5.66	0.10

Note. Time 1 = Baseline; Time 2 = Immediate follow-up post-intervention; Time 3 = Four-week follow-up post-intervention. Statistics reported are marginal means (*M*) with standard errors (*SE*) for participants remaining in the study after follow-up (*N* = 201).

Figure 1
Plot of Gender x Time Interaction for Attitude Scores

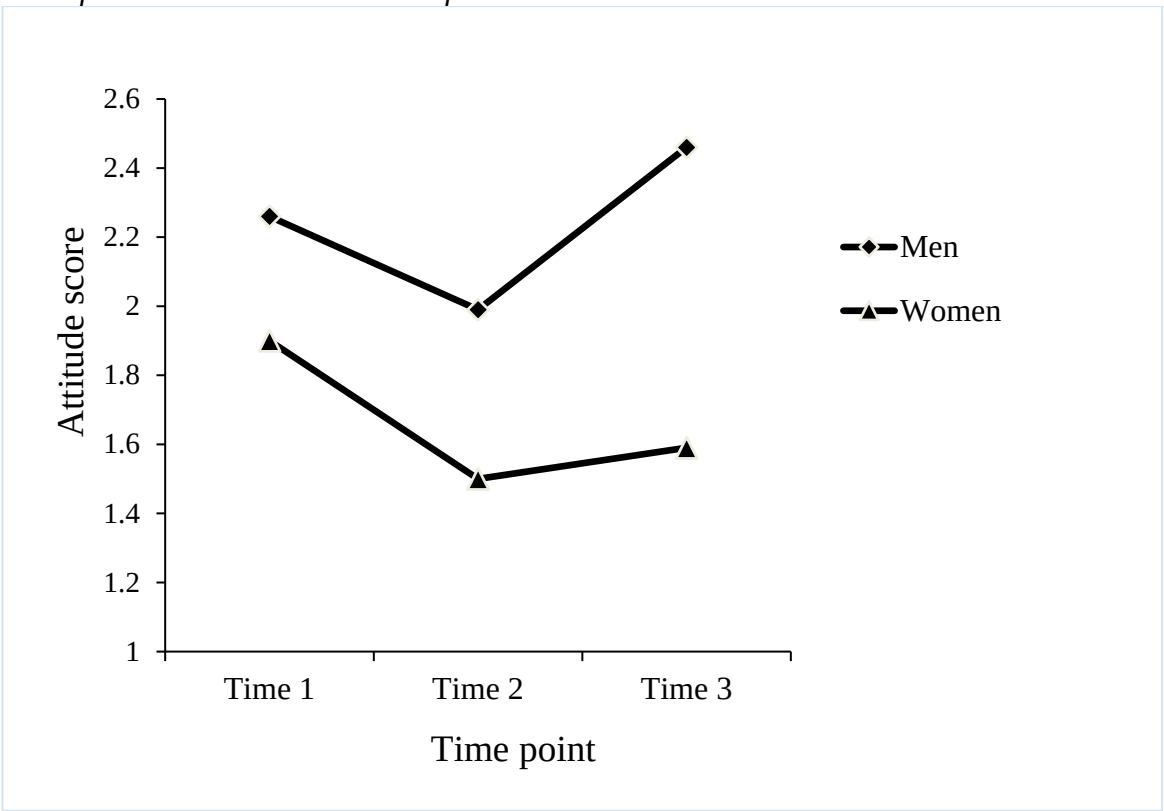

Figure 2
Plot of Gender x Time Interaction for Subjective Norm Scores

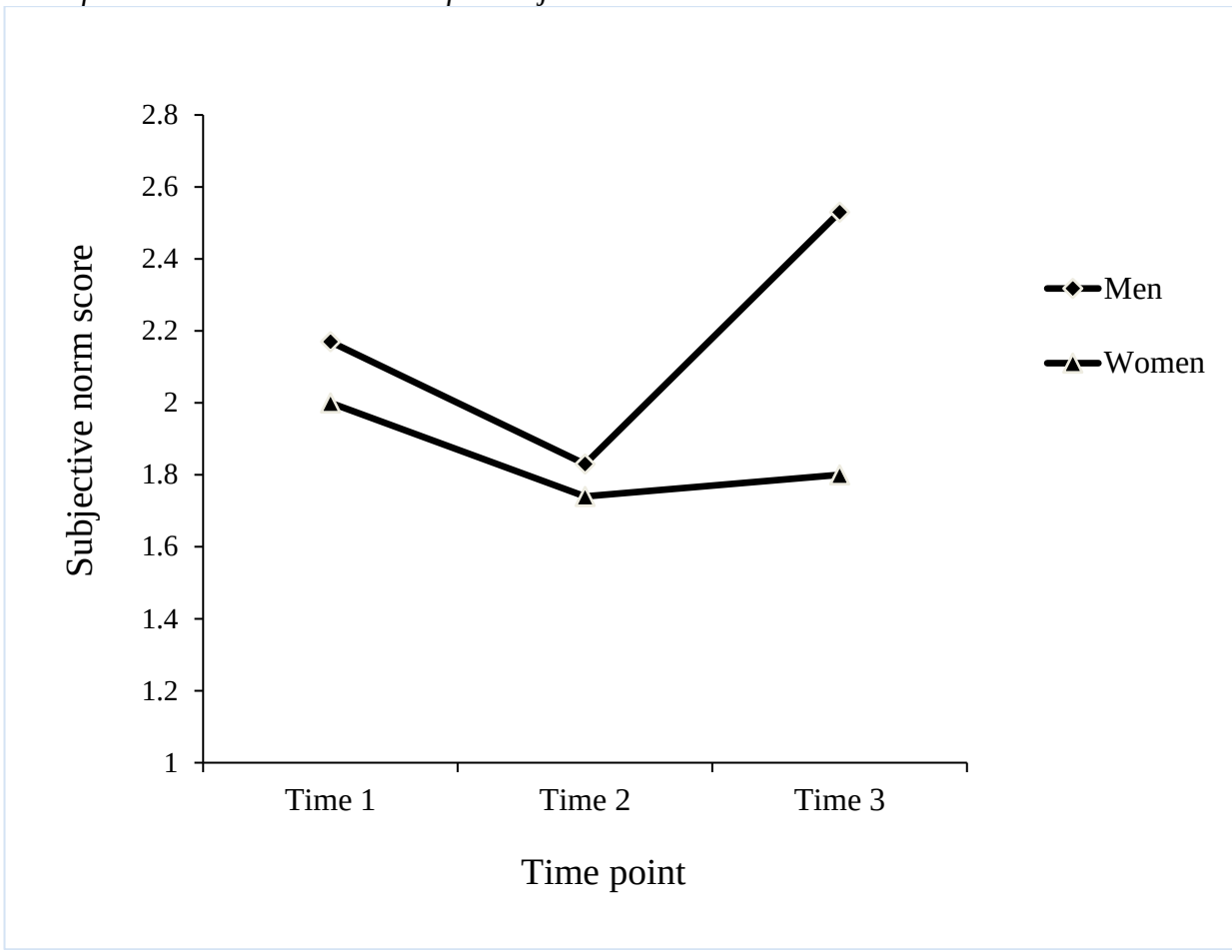

Figure 3
Plot of Gender x Time Interaction for Perceived Susceptibility Scores

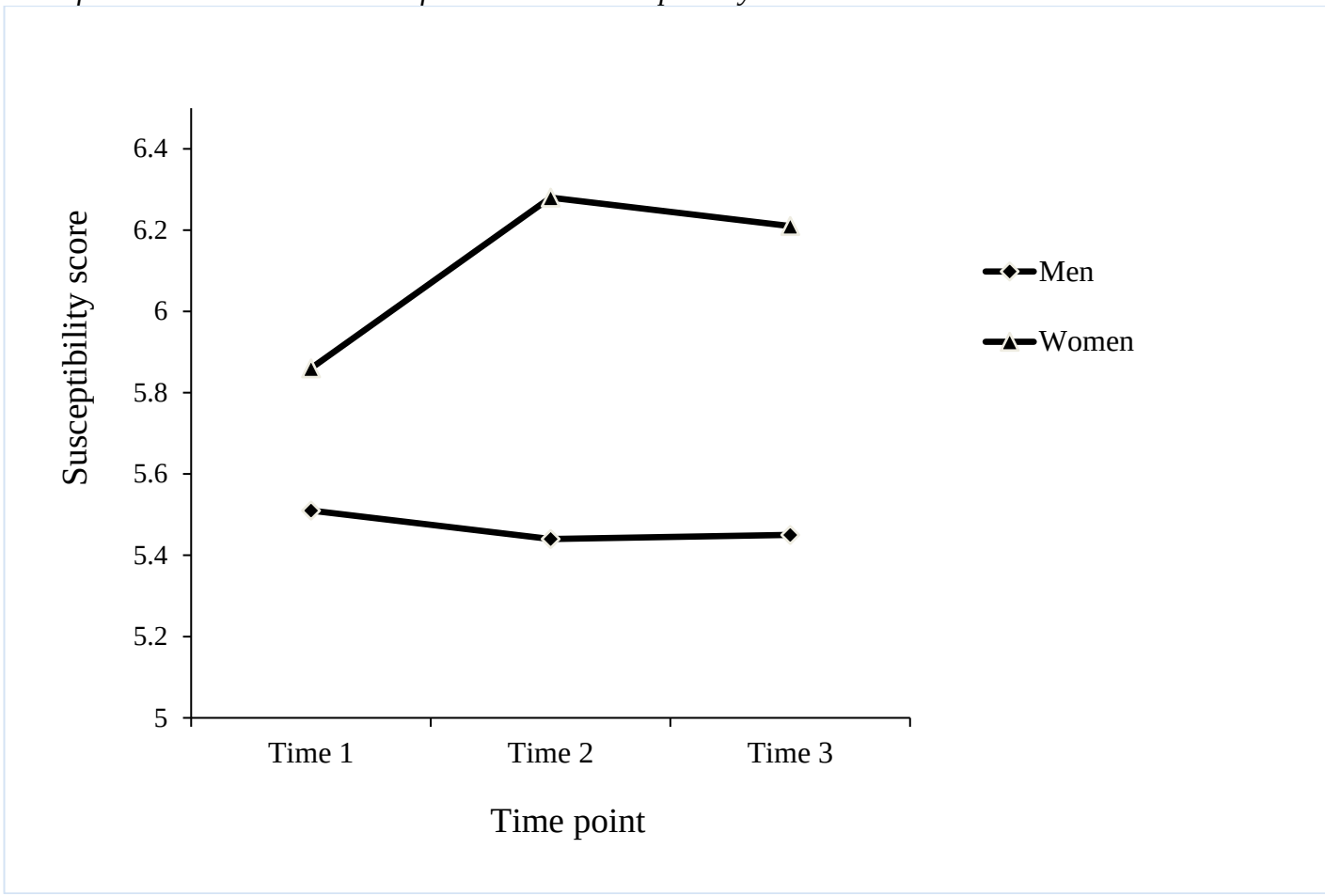

Figure 4
Plot of Gender x Time Interaction for Perceived Severity Scores