

# The relative efficacy of positively and negatively valenced road safety campaign messages in improving dangerous driving attitudes

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## Key Findings

- The research investigated the relative efficacy of positively and negatively valenced road-safety campaign messages in improving dangerous driving attitudes.
- Marked differences across sex existed in drivers' motivations to drive dangerously, as well as their planned driving behavioural change after viewing the safety messages.
- There was significantly greater reported message impact from the positive campaign, compared to the negative campaign overall, however, differences in impact existed as a function of drivers' age and sex.
- Among female drivers, a number motivators of dangerous driving were linked to message impact from safe driving campaigns, revealing potential value in the leveraging of psychological individual differences in anticipating message impact.

## Abstract

Dangerous driving is a social problem that results in serious injuries, fatalities, and significant economic costs. Extensive research has examined the efficacy of road safety campaigns in curbing dangerous driving, however, these investigations have largely focused on negatively valenced messages. Less attention has been paid to positively valenced examples, and the role of drivers' motivations for dangerous driving in relation to message impact. One hundred sixty licensed drivers (female,  $n = 120$ ; male,  $n = 30$ ; other,  $n = 10$ ) completed a questionnaire that measured their current driving behaviours and their motives for driving dangerously. Drivers then viewed one of two safe driving messages (either positive or negative in valence) and provided a gauge of message impact. Finally, looking to the future, participants completed a measure of planned driving behaviour. Results revealed differences across sex in drivers' motivations to drive dangerously, as well as their planned behavioural change after viewing the safety messages. On average, participants recorded greater response efficacy and message acceptance, and lower message rejection in the positive message group, compared to the negative message group. Further, in a separate analysis of female-only drivers, a number motivators of dangerous driving were linked to message impact from safe driving campaigns. The findings suggest that, despite the traditional dominance of negatively valenced campaigns, there may be benefit in the use of positive campaigns, and further that motivators of dangerous driving can be linked to message impact from safe driving campaigns, supporting the case for a more targeted approach in campaign design.

## Keywords

Driving; road safety; motivation; message impact; safety marketing

## Introduction

Dangerous driving is a problem that society has faced for decades, resulting in significant social costs such as fatalities, injuries and reduced quality of life, and economic costs such as medical expenses, property damage, and loss of productive capacity (Elvik et al., 2007). Crashes may be

defined as “any apparently unpremeditated event reported to the police and resulting in death, injury or property damage attributable to the movement of a road vehicle on a road” (Transport for NSW, 2017, p. 12). The World Health Organisation (WHO) estimates that such traffic

collisions may become the third largest cause of death by 2020 (Carey, McDermott, & Sarama, 2013). Although a large number of traffic incidents may be causally attributed to situational factors largely outside of a driver's control, a significant number are attributed to dangerous driver behaviours. For instance, in Australia's most populated state (New South Wales), speeding was deemed a factor in 23.5% of crashes resulting in serious injury.

Some well-researched factors associated with dangerous driving include driver anger (Lawton, Parker, Stradling, & Manstead, 1997; Parker, Lajunen, & Stradling, 1998; Van Rooy, Rotton, & Burns, 2006), age and sex (Arnett, Offer, & Fine, 1997; Ben-Ari, Florian, & Mikulincer, 1999; Fleiter, Watson, Lennon, & Lewis, 2006; Harré, Field, & Kirkwood, 1996; Jonah, 1997; Kohler, 1996), and other situational characteristics (e.g., the presence of certain passengers, forms of music, ambient temperature, and even the colour of other cars; Arnett, et al., 1997; Guéguen, Jacob, Lourel, & Pascual, 2012; Kenrick & MacFarlane, 1986; Pêcher, Lemerrier, & Cellier 2009).

Some contributing factors to dangerous driving are not easily (if at all) changeable by road authorities aiming to improve road safety (e.g., drivers' personality, age, sex, etc.). However, key features that can potentially be targeted for change are a person's motivators to engage in various driving behaviours. By identifying specific motivators, and designing messages targeted to either change or raise awareness of them, authorities may influence drivers' behavioural choices to effect safer driving outcomes. Research identifying underlying motivators and methods to influence them is an area that has received comparatively less research than others.

Ho and Gee (2008) investigated motivators of young males (200 aged 18-24 years) to drive dangerously and found three factors when developing the Motives for Dangerous Driving Scale (MDDS): "driving fast/risk taking", "confidence in one's driving skills", and "disrespect for traffic laws". The motivators of driving fast/risk taking is a useful one to target, as chosen speed and undertaking risky driving manoeuvres are explicit choices addressable by road safety campaigns by, for instance, clearly articulating the demonstrable consequences to both themselves and others (e.g., imprisonment, death, etc.) of this behaviour. Confidence in one's driving skills is another that can be addressed by, for instance, providing illustrative examples of even skilful drivers being involved in serious at-fault crashes. And finally, disrespect for traffic laws is fundamental, as traffic laws represent enforceable guidelines as to what does and does not constitute safe driving practices. Disrespect for these laws may indicate, for example, a digression of one's perception of danger from that espoused by authorities, a disregard of the potential consequences and risks, or both. This motivator could be addressed by communicating the bases of traffic rules and their evidence-based role in preventing injury,

in a persuasive manner suitable for the particular target audience. Overall, the MDDS provides a platform for gauging drivers' motivators that may be associated with drivers' engagement with road safety campaigns.

Road safety campaigns involve communicating persuasive messages to motivate a target population to change attitudes and behaviours, with a view to improving road safety (Delhomme, Dobbeleer, Forward, & Simões, 2009). Whilst they can be conveyed in a rational manner by using the presentation of basic information (e.g., penalties for speeding), the generation of an emotional response on the part of the viewer can increase the effect (Elliott, 1993; Ulleberg et al., 2009), including both positive (Weinberger & Gulas, 1992) and negative (Lewis, Watson, & White, 2008) valence.

There is definitional inconsistency for "positive" and "negative" road safety messages (Donovan, Henley, Jalleh, & Slater, 1995; Henley, Donovan, & Moorhead, 1998), making generalisation of research findings difficult. An appealing differentiation to make is that positive messages communicate the positive (favourable) consequences of driving safely, compared to negative messages which emphasise negative (unfavourable) consequences of driving dangerously (Sibley & Harré, 2009). Multiple elements of a message can vary in valence, including message framing effects, offer of rewards or punishment, and motivations referred to (Lewis, Watson, & White, 2009). For example, a message could be framed to encourage the viewer to drive to the speed limit by presenting the negative consequences of not doing so, such as the loss of licence. This message may also engage a particular motivation (e.g., the viewer desires to keep their licence), which could lead to the arousal of emotion (e.g., fear of losing their licence).

Inconsistent findings have led to difficulty in concluding which emotions work best in road safety campaigns (Institute for Road Safety Research, 2008; Lewis, Watson, Tay, & White, 2007; Ulleberg et al., 2009), whether to refer specifically to risks in messages (Elliott, 1993; Lewis et al., 2007; Snyder, 2001; Weber, Martin, & Corrigan, 2006; Williams, Reinfurt, & Wells, 1996), and whether an alternative should be communicated. For example, Tay and Watson (2002) found that effectiveness for anti-fatigue messages was higher if an alternative behaviour was offered (e.g., having a nap); a similar effect has been shown for drink-driving (Tay, 2005). Unfortunately, unless the primary reason a person chooses to speed is due to poor time management (addressable by, for example, leaving for one's destination earlier), there are few clear alternatives to speeding other than to simply not speed.

A range of person-related characteristics including socio-demographic features and pre-existing beliefs will influence a message's effectiveness when received by the target (Lewis, Watson, & White, 2009), which is a compelling argument for thorough pretesting of a message to ensure that these are factored into the design, and that

the message is a good fit for the target audience (Ben-Ari, Florian, & Mikulincer, 1999; Donovan, Henley, Jalleh, & Slater, 1995). A perception of personal involvement with and relevance of message content influences its persuasive ability (Petty, Haugtvedt, & Smith, 1995; Petty & Wegener, 1999). Generating an optimum level of perceived relevance is crucial to mitigate the ‘Third Person Effect’ (TPE), in which the viewer believes that the adverse consequences demonstrated are more likely to impact another person (Davison, 1983). However, a message can also be seen as “too relevant” (Higbee, 1969; Phau, 2000; Quinn, Meenagha, & Brannick, 1992), and then be ignored or rejected due to, for example, it being perceived as an overt attempt by an authority to change their behaviour. Demographic differences in the experience of the TPE (and other biases) are worthwhile considering when designing messages targeted at, for example, a particular sex. Indeed, males tend to demonstrate the TPE when viewing messages containing fear but less so for humorous messages (Lewis, Watson, & Tay, 2007; Lewis, Watson, & White, 2008). The arousal of fear by way of the “threat appeal” has been a prominent feature of road safety campaigns.

Threat appeals are frequently used in road safety campaigns, based on the premise that fear arousal increases the likelihood that viewers pay attention to and accept recommendations (Witte & Allen, 2000). They attempt to scare people into performing (or not performing) particular behaviours by depicting terrible consequences (Witte, 1992). Whilst many safe driving messages include physical threat such as death (Tay & Watson, 2002), some audiences do not perceive these as relevant, including high-risk drivers (Lewis, Watson, & Tay, 2007; Tay, 2002). By contrast, social threat (e.g., stigma associated with loss of licence) can be more effective (Kohn et al., 1982; Lewis, Watson, White, & Tay, 2007; Pechmann & Knight, 2002; Rotfield, 1999; Schoenbachler & Whittler, 1996).

The “Extended Parallel Processing Model” (EPPM; Witte, 1992) suggests that two cognitive appraisals occur upon fear induction: “threat appraisal” and “coping appraisal”. Threat appraisal is the degree to which a threat is felt personally, its perceived relevance, and perceived likelihood of occurring. If the threat is sufficiently strong, the fear invoked may motivate more in-depth processing and engagement with the recommendations, referred to as “danger control”. If the threat is too severe, defensive mechanisms may be engaged (such as avoidance) such that in-depth processing would not occur; this process is referred to as “fear control”. Coping appraisal involves assessing the viability of the alternative behaviour suggested (if any) to avoid the threat (“response efficacy”), and whether the viewer perceives that they can execute it (“self efficacy”). Successful communication of response efficacy and self efficacy can lead to the desired outcome of danger control; failure to communicate response efficacy may invoke feelings of helplessness towards the threat and lead to fear control. Witte (1992) found that fear

led to failure in the threat appeal (via fear control), but cognitions lead to success (via danger control). Coping appraisal is followed by selection of either adaptive or maladaptive behaviours, which may be represented by the factors of “message acceptance” and “message rejection” (Witte, 1992) that can be used to gauge message efficacy.

One of the ways that efficacy of threat appeals has been measured is by the degree of message acceptance, which is the intention to change behaviour as advocated by the message (Witte, 1992). Message rejection is another, less used measure (Lewis, Watson, & White, 2009), and refers to defensively avoiding, ignoring, denying or minimising the essence of the message (Tay & Watson, 2002; Witte, 1992). Message rejection adds to the explanation of actual behaviour, incremental to message acceptance (Lewis, Watson, & White, 2008). Response efficacy is positively associated with message acceptance and negatively associated with message rejection (Tay & Watson, 2002; Witte, 1992), and has more influence on adaptive outcomes than the amount of fear induced (Floyd, Prentice-Dunn, & Rogers, 2000; Tay & Watson, 2002; Witte & Allen, 2000). Response efficacy improves persuasive ability (Floyd, Prentice-Dunn, & Rogers, 2000), and whilst its inclusion may depend on targeted behaviour (e.g., drink driving as distinct from speeding), empirical evidence suggests that all safe driving messages ought to incorporate it to some degree (Lewis, Watson, & White, 2009).

The efficacy of threat appeals has been questioned, in addition to ethical and practical concerns (de Hoog, Stroebe, & de Wit, 2008). For example, whilst threat appeals work under certain conditions (e.g., Witte & Allen, 2000), they can also be ineffective and actually lead to an increase in the undesirable behaviour (e.g., Caren & Sarma, 2011; Jessop, Albery, Rutter, & Garrod 2008). Message efficacy is also influenced by sex; females generally show a more effective response than males (Goldenbeld, Twisk, & Houwing, 2008; Lewis, Watson, & Tay, 2007; Tay & Ozanne, 2002). Uncertainty in the causal relationship between fear and behaviour, including inconsistencies in definitions and confounding emotions (Baumeister, Vohs, DeWall, & Zhang, 2007; Carey, Mcdermitt, & Saram, 2013), has contributed to interest in positive safe driving messages from researchers (Elliott, 2005) and the general public (Lewis, Watson, White, & Tay, 2007).

Positive road safety messages are likely to invoke positive reactions such as laughter, and may be considered as positive emotion based appeals (Lewis, Watson, White, & Tay, 2007). These are more likely to appeal to some target groups, such as males (Goldenbeld, Twisk, & Houwing, 2008; Lewis, Watson, & White, 2008), which is opposite to the relationship with threat appeals (Conway & Dubé, 2002; Goldenbeld, Twisk, & Houwing, 2008; Lewis, Watson, & White, 2008). They are also effective for young drivers (Sibley & Harré, 2009) who, along with males, are chief among those who violate traffic laws, so a more

widespread utilisation of targeted positive safe driving messages seems logical. While the value of positively valenced media has been found to promote stronger engagement and even greater ‘viral’ sharing compared to negative approaches in other media (e.g., Berger, & Milkman, 2013), there are far fewer studies exploring the efficacy of positive safe driving messages compared to negative ones, which is an area worthy of further research (Goldenbeld, Twisk, & Houwing, 2008; Lewis, Watson, & White, 2008; Nabi, 2002).

Whilst some published evaluations of road safety campaigns analyse efficacy for particular groups or behaviours, there appears to be a lack of similar attempts to correlate efficacy with particular motivators of dangerous driving. As reviewed earlier, people drive dangerously for many reasons, including the influence of underlying motivators and pre-existing beliefs, which may offer some specific target areas for road safety campaigns. As mentioned previously, targeted and personalised messages can be more effective than campaigns en masse. Therefore, applying a targeted approach to address specific motivators and beliefs may provide a useful method to direct the most relevant messages to where they would be most effective. Evaluations of this approach would yield valuable data for the design of future road safety campaigns, and mandatory safe driving programs for repeat offenders.

The current study aimed to test the relative efficacy of positively and negatively valenced road safety campaigns in relation to drivers’ reported message acceptance, message rejection, and response efficacy. Self-efficacy was intentionally excluded from the investigation, as the authors believe that response efficacy has the greatest potential for practical implications for a persuasive message (i.e., campaign designers can more readily identify strategies that may be useful for a particular audience), compared to self-efficacy, which is presumed to be less amenable to change following brief exposure to a campaign message (Lewis, Watson, & White, 2010). Participants’ pre-message dangerous behaviour was also compared to post-message planned behaviour, to examine whether the messages were effective in changing drivers’ intentions regarding future driving. Further, the study explored whether three dimensions of motivation for dangerous driving previously highlighted by Ho and Gee (2008) (i.e., driving fast/risk taking, confidence in one’s driving skills, and disrespect for traffic laws) could predict message impact for the positive and negative campaigns. Finally, as drivers’ age and sex has consistently been shown to be a salient factor in drivers’ attitudes and behaviours (Allison, Jordon, & Yeattes, 1992; Arnett et al., 1997; Deffenbacher, Oetting, & Lynch, 1994; Fleiter, Watson, Lennon, & Lewis, 2006; Harré, Field, & Kirkwood, 1996; Harré, Foster, & O’Neill, 2005; Iram & Taubman, 1994; Jonah, 1997; Kohler, 1996; Zuckerman et al., 1966) as well as message efficacy (Goldenbeld, Twisk, & Houwing, 2008; Lewis, Watson, & Tay, 2007; Tay &

Ozanne, 2002), the study aimed to investigate potential age and sex-based differences in motivations for driving dangerously, message impact relating to the driving campaigns, and potential attitude change following the safe driving message.

## Methods

### Participants

One hundred sixty students enrolled in first and second year psychology units at the Australian College of Applied Psychology (ACAP) participated in the study via the College research portal. Participation was entirely voluntary, and participants were reimbursed for their time with a small percentage of course credit. Of these, 120 were female ( $M_{age} = 28.71$ ,  $SD_{age} = 8.86$ ,  $Range = 18 - 54$ ), 30 were male ( $M_{age} = 29.32$ ,  $SD_{age} = 8.24$ ,  $Range = 19 - 57$ ), and 10 did not specify sex ( $M_{age} = 31.48$ ,  $SD_{age} = 9.98$ ,  $Range = 20 - 53$ ). All were licensed drivers.

### Measures

Participants completed an online survey comprising questions assessing: demographics (age, sex, driving experience); current dangerous driving behaviours; motivators of dangerous driving (measured using driving fast/risk taking, confidence in one’s driving skills and disrespect for traffic laws); and message efficacy (measured using message acceptance, message rejection, and response efficacy). Participants then viewed one of two (positively or negatively valenced) video-based road safety messages, and after viewing completed a measure of planned dangerous driving behaviours. The between-subjects design was adopted to eliminate potential contrast effects that could arise from participants viewing both messages.

### Materials

#### Manchester Driving Behaviour Questionnaire (DBQ)

A version of DBQ (Reason et al., 1990) modified by Davey, Wishart, Freeman, and Watson (2007) for an Australian driving population was chosen to measure actual driving behaviour. Respondents were required to indicate on a six point Likert-type scale (0 = *Never* to 5 = *Nearly all the time*) how often they engage in various driving behaviours, such as “race away from traffic lights to beat the car besides you”. The measure consisted of 20 items, with greater total scores indicating greater endorsement of dangerous driving behaviours. The modified DBQ has shown acceptable reliability (Cronbach  $\alpha$  of .60 to .80; Davey, Wishart, Freeman, & Watson, 2007). The measure was also used to assess planned driving behaviour, with slight adjustments to wording to relate questions to future tense.

### The Motives for Dangerous Driving Scale (MDDS)

The MDDS (Ho & Gee, 2008) was used to measure motivators of dangerous driving. The MDDS was originally developed using a population of young male drivers, showing acceptable reliability (Cronbach  $\alpha$  of .82 to .94). Respondents were required to indicate on a six point Likert-type scale (1 = *Strongly agree* to 6 = *Strongly disagree*) how often they engage in various driving behaviours such as “I take out my frustrations by driving fast” and opinions such as “I am a more skilful driver than most other drivers on the road”; it is these behaviours and opinions from which underlying motivations are implied. Its 29-items yield three factors: driving fast/risk taking (15 items), confidence in one’s driving skills (eight items), and disrespect for traffic laws (six items). Scale scores were converted where necessary so that greater total scores indicated greater endorsement for each factor (i.e., higher scores equated to greater instances of driving fast/risk taking, confidence in one’s driving skills, and disrespect for traffic laws).

### Message Impact

Measures of message impact were drawn from Lewis, Watson, and White (2010), and comprised items relating to three factors: message acceptance (four items), message rejection (five items), and response efficacy (three items). These measures yielded acceptable internal reliability in the original study (Cronbach  $\alpha$  of .73 to .86). For all items, respondents were required to indicate on a seven point Likert-type scale (1 = *Strongly agree* to 7 = *Strongly disagree*) the extent to which they agreed with various statements about the safe driving message they watched, such as: “adopting the advertisement’s recommendations would be effective in reducing speeding”, and “as a result from watching the video, do you intend to obey the speed limit”. Scale scores were converted where necessary so that greater total scores indicated greater endorsement for each factor (i.e., higher scores equated to greater instances of message acceptance, message rejection, and response efficacy).

### Safe Driving Messages

The negative safe driving message was a television advertisement released as part of the “10 km less” campaign by the Transport and Accident Commission (TAC) in the Australian State of Victoria in 1997 (TAC, 1997). It depicted a computer generated slow-motion video of a man being hit by a car, with a narrative spoken by a trauma surgeon describing the effect on the human body during each stage of the incident (e.g., “bumper hits the knee joint, tearing flesh and ligaments”). A second video then shows what would have happened had the driver been travelling at a speed 10 km/h less than what was portrayed in the first video. This was chosen as the negative safe driving message as its main focus was the depiction of the potential adverse consequences of speeding. The advertisement was 60 seconds in length.

The positive safe driving message used was a television advertisement released as part of the “Enjoy The Ride” campaign by the Office of Road Safety (OSR) in the Australian State of Western Australia in 2011 (OSR, 2011). It depicts various scenarios in which people are moving at a rushed pace (e.g., running down a busy city street), with a narrator posing rhetorical questions about the virtues of such an approach to life. It then depicts other scenarios in which people are behaving at a more relaxed pace (e.g., a woman relaxing in a bath), with the narrator espousing the virtues of slowing down in life. Various driving scenarios then show actors behaving in a relaxed state whilst in their vehicle, including a comparison between a driver that is explicitly depicted as speeding, and another driver who follows the speed limit, with the latter exhibiting a decisively happier expression than the former, who appears tense and stressed. This was chosen as the positive safe driving message as its main focus was the depiction of the favourable consequences of driving at the speed limit. The advertisement was 64 seconds in length.

### Procedure

Survey platform Qualtrics® (Qualtrics LLC, Provo, UT, USA) was used to host the driving messages and measures. Upon completing the demographics, DBQ, and MDD measures, the platform randomly assigned participants into one of two groups: one group was to be shown the positive safe driving message, and the other group to be shown the negative safe driving message. The format for both videos was identical, and was displayed via an embedded YouTube link. After viewing, participants answered the questions relating to message impact. Finally, the DBQ (adjusted to refer to planned driving behaviour) was administered.

## Results

### Message impact

Using a one-way multivariate analysis of variance (MANOVA), three dependent variables (DVs) related to message impact (message acceptance, message rejection, and response efficacy) were analysed for differences across the two road safety campaign conditions. The DVs were found to be moderately intercorrelated, and all parametric assumptions were met. Wilks’s Lambda test revealed a significant multivariate effect for valence,  $\lambda(3, 144), p = .041, \eta^2 = .06$ . Tests of between-subjects effects revealed significantly greater response efficacy ( $p = .050$ ) and message acceptance ( $p = .008$ ), and lower message rejection ( $p = .040$ ) in the positive message group, compared to the negative message group. Descriptive statistics are shown in Table 1.

To determine whether message impact varied as a function of drivers’ age and/or sex, Pearson’s correlational analyses were performed on the three variables relating to message impact (message acceptance, message rejection, and response efficacy), stratified by drivers’ sex and the

**Table 1. Descriptive Statistics for Message Impact**

Group	<i>M (SD)</i>	95% CI
Positive		
Message Acceptance	10.76	[9.60, 11.92]
Message Rejection	23.91	[22.38, 25.44]
Response Efficacy	8.57	[7.63, 9.52]
Negative		
Message Acceptance	8.51	[7.33, 9.68]
Message Rejection	26.19	[24.64, 27.74]
Response Efficacy	7.26	[6.30, 8.22]

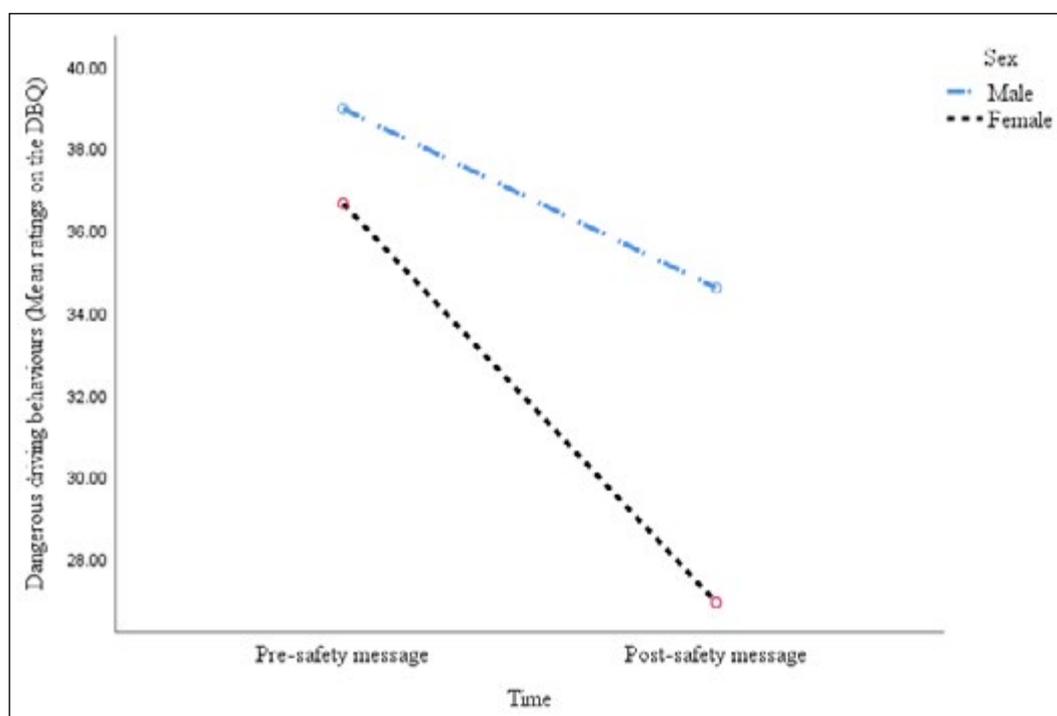
Note: *M* = Mean; *SD* = Standard Deviation; CI = Confidence interval. Scores for each factor of message impact had a possible range of 4-28 (Message Acceptance), 5-35 (Message Rejection), and 3-21 (Response Efficacy); with greater scores indicating greater endorsement of the factor.

message valence (positive and negative). Participants who did not report a sex were excluded from the analysis. The results revealed several statistically significant associations. For male drivers, age was negatively associated with message acceptance in the positive condition ( $r = -.503, p = .047$ ), suggesting that younger male drivers showed greater levels of acceptance of the positive message. In contrast, older female drivers were typically more accepting of the positive message ( $r = .248, p = .050$ ), also rating less message rejection ( $r = -.302, p$

$= .017$ ), and greater response efficacy ( $r = .357, p = .005$ ). In relation to the negative message, neither females' nor males' age shared a relationship with message impact (all  $p > .05$ ).

**Intention to change driving behaviour**

Participants' reported pre-message dangerous driving behaviour was compared to their post-message planned behaviour to test the effectiveness of the campaigns in changing participants' intentions. Participants ratings were



Note: Scores on the DBQ had a possible range of 0-100; with greater scores indicating greater endorsement of dangerous driving behaviours.

**Figure 1. The interaction between time and sex for participants' reported dangerous driving behaviours**

**Table 2. Individual parameter estimates (motivators) by outcome (message impact) for both positive and negative valence conditions for the female driver subgroup**

Valence	Outcome (Message Impact)	Parameter (Motivator)	B	Std. Error	t	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Positive	ResponseEfficacy	Driving Fast/Risk Taking	-.055	.075	-.728	.470	-.205	.096
		Confidence In Driving Skills	.306	.115	2.657	.010	.075	.538
		Disrespect For Traffic Laws	-.047	.205	-.231	.818	-.458	.364
	MessageAcceptance	Driving Fast/Risk Taking	-.142	.106	-1.345	.185	-.355	.070
		Confidence In Driving Skills	.246	.156	1.579	.121	-.067	.560
		Disrespect For Traffic Laws	-.060	.295	-.203	.840	-.653	.533
	MessageRejection	Driving Fast/Risk Taking	.170	.138	1.237	.222	-.106	.447
		Confidence In Driving Skills	-.298	.211	-1.415	.163	-.721	.125
		Disrespect For Traffic Laws	.548	.372	1.475	.146	-.198	1.294
Negative	ResponseEfficacy	Driving Fast/Risk Taking	-.006	.112	-.057	.955	-.231	.219
		Confidence In Driving Skills	-.202	.160	-1.261	.214	-.524	.121
		Disrespect For Traffic Laws	-.216	.239	-.902	.372	-.697	.266
	MessageAcceptance	Driving Fast/Risk Taking	-.018	.109	-.165	.869	-.237	.201
		Confidence In Driving Skills	-.166	.158	-1.052	.298	-.484	.152
		Disrespect For Traffic Laws	-.500	.234	-2.136	.038	-.970	-.029
	MessageRejection	Driving Fast/Risk Taking	-.150	.130	-1.150	.256	-.412	.113
		Confidence In Driving Skills	-.040	.189	-.209	.835	-.419	.340
		Disrespect For Traffic Laws	.408	.280	1.458	.152	-.155	.972

Note: Scores for each factor of message impact had a possible range of 4-28 (Message Acceptance), 5-35 (Message Rejection), and 3-21 (Response Efficacy); with greater scores indicating greater endorsement of the factor. Scores for each factor of motivation had a possible range of 15-90 (Driving Fast/Risk Taking), 8-48 (Confidence In Driving Skills), and 6-36 (Disrespect For Traffic Laws); with greater scores indicating greater endorsement of the factor.

analysed using a 2 (time) x 2 (sex) x 2 (valence) mixed repeated measures analysis of variance (ANOVA) ( $\alpha = .05$ ). Age was initially considered as a covariate, however as correlational analysis failed to reveal a significant relationship with drivers' actual or planned behavior, it was excluded from the analysis. A significant main effect was

identified for the differences in reported driving behaviours means across time,  $F(1, 1974) = 71.60, p < .001, \eta^2 = .06$ ; with participants intending to drive less dangerously after watching the safety message. This effect was irrespective of the message valence. Further, a main effect for sex existed,  $F(1, 1974) = 71.60, p < .001, \eta^2 = .40$ ; whereby

males' possessed significantly higher ratings for driving dangerously compared to females overall, regardless of when the ratings were taken. Most importantly, the results revealed a significant interaction between Time and Sex,  $F(1, 275) = 9.98, p = .002, \eta^2 = .09$ , demonstrating that only the female drivers reported that they intended to significantly change their future driving behaviour at the conclusion of the study. The interaction is shown in Figure 1.

### Motivators for dangerous driving and message impact

Several analyses were performed to test whether significant differences existed in participants' reported motivators for dangerous driving based on drivers' sex and age. Independent *t* tests revealed significant differences between female and male participants across drivers' motivators: Driving Fast Risk Taking ( $p = .033, r = .17$ ); Confidence in Driving Skills ( $p = .025, r = .17$ ); and, Disrespect for Traffic Laws ( $p = .001, r = .24$ ). Males were found to have significantly higher ratings for all three variables. Pearson's correlational analyses revealed no significant association between the motivators and drivers' age.

In light of the significant differences in motivators found between males and females, it was decided that participants' data could not be collapsed into a common group for the final analysis examining drivers' motivators. Further, as the male sample size was modest (30), a lack of projected statistical power using regression techniques precluded the group's inclusion in a separate analysis. Regression analyses were performed on the female driver sample to attempt to predict message impact from motivations for driving dangerously. Analyses included the three motivators regressed on the three outcome dimensions of message impact (i.e., response efficacy, message acceptance, and message rejection), for responses in the positive and negative safety campaign conditions. The results revealed that confidence in driving skills positively predicted response efficacy in the positive driving condition. Further, disrespect for traffic laws negatively predicted message acceptance in the negative condition. Individual parameter estimates for both conditions are shown in Table 2.

## Discussion

The current study aimed to test the relative efficacy of positively and negatively valenced road safety campaigns in relation to drivers' reported message acceptance, message rejection, and response efficacy. Participants' pre-message dangerous behaviour was also compared to post-message planned behaviour, to examine whether the messages were effective in changing drivers' intentions for future driving. Further, the study explored whether three dimensions of motivation for dangerous driving (i.e., driving fast/risk taking, confidence in one's driving skills, and disrespect for traffic laws) could predict message

impact for the positive and negative campaigns. Finally, the study explored potential age and sex-based differences in motivations for driving dangerously, message impact relating to the driving campaigns, and potential attitude change following the safe driving message.

### Message impact

The results revealed significantly greater response efficacy and message acceptance, and lower message rejection in the positive message group, compared to the negative message group. The findings suggest that there may be benefit in the use of positively valenced safety campaigns, despite the traditional dominance of negative campaigns. Although the initial analyses revealed an overall greater benefit from the positive message, examination of the relationship between message impact and drivers' age and sex revealed a far more complex picture.

For male drivers, age was negatively associated with message acceptance in the positive condition, suggesting that younger male drivers showed greater levels of acceptance of the positive message. This result is largely consistent with the extant literature, which would suggest that positive emotion-based messages would appeal most to young males (Goldenbeld et al., 2008; Lewis et al., 2008; Sibley & Harré, 2009). In contrast, older female drivers were typically more accepting of the positive message also rating less message rejection, and greater response efficacy. These relationships were not present for the negative message. While the reasons for these differences across age and sex are largely a matter of speculation, most importantly, the finding provides evidence that the efficacy of safety messages in engaging viewers does vary significantly as a function of individual features, such as drivers' age and sex; simply, one size does not fit all, and there is a clear case to continue this line of investigation into the role of individual differences in drivers' engagement with safety messages.

### Intention to change driving behaviour

While the safe driving messages were found to have a positive influence on drivers' planned behaviours, this effect occurred irrespective of message valence, and critically, was only observed in the female driving group. In relation to the female drivers, this promising result suggests that video-based safety driving campaigns, whether negative or positive in valence, may be effective in inspiring positive attitudinal change. In contrast, for the male drivers, these results while equally disheartening, are unfortunately unsurprising. Males have been frequently found to demonstrate the 'Third Person Effect', in which the viewer believes that the adverse consequences demonstrated are more likely to impact another person (Davison, 1983), when viewing messages containing fear (Lewis, et al., 2007; Lewis, et al., 2008); presumably the predominant emotion intended to be evoked by the negative message used in the study. While males

experience the ‘Third Person Effect’ to a lesser extent for humorous messages, humour was notably absent from both the positive and negative messages used. Future research should look to expand on the safety messages used to investigate a broader array of emotions, which may impact male drivers’ attitudes to dangerous driving behaviour.

### Message impact and motivators for dangerous driving

Significant differences between female and male drivers were revealed in relation to the motivators of dangerous driving. These results are consistent with the extant literature, which consistently finds males to be more likely to engage in risky driving behaviours (Fleiter, Watson, Lennon, & Lewis, 2006; Harré, Field, & Kirkwood, 1996), are more prone to overconfidence in their skills (Harré, Foster, & O’Neill, 2005), and are disproportionately represented in experiencing road trauma (Australian Transport Safety Bureau, 2007). These findings provide further support for the consideration of target drivers’ sex when designing road safety campaigns.

When isolating the female driving sample, confidence in driving skills predicted response efficacy (positively), but showed no such relationship with the negative safe driving message. This suggests that those who were more confident in their driving skills were more likely to perceive that the suggestions contained in the positive safe driving message (e.g., slowing down) could lead to safer driving outcomes. How this perception could relate to one’s confidence in their own driving is unclear; perhaps those with lower confidence may grapple with challenges on the road not easily mitigable by slowing down, which is something that they may already do. Notably, confidence was did not predict perceptions of response efficacy for negative campaigns, suggesting that participants may have felt helpless towards the threats depicted in the campaign. This is quite possibly due to the fact that the campaign focussed largely on the consequences to the pedestrian being hit by the car, not those experienced by the driver directly. This finding is noteworthy, as although the consequences in the negative video are presumably somewhat relatable, there may exist an important barrier to attitude change. Here, we may again see evidence of a ‘Third Person Effect’ in relation to threat appraisal. Threat appraisal, the degree to which a threat is felt personally, its perceived relevance, and perceived likelihood of occurring, is thought to be critical in relation to engagement and processing of negative campaigns. More research is needed to investigate drivers’ specific perceptions of threat appraisal in safety messages and the relationship it may hold with message impact.

Importantly, driving fast/risk taking failed to predict message impact in both conditions. This is particularly interesting, as both campaigns incorporated an emphasis on the consequence of drivers’ speed. This demonstrates that neither the positive or negative safe driving message was

effective in their persuasive ability for drivers who seek to drive fast and take risks. This population continues to be a research priority in the design of safety interventions.

Disrespect for traffic laws negatively predicted message acceptance for the negative safe driving message, meaning that drivers who were higher in this motivator were less likely to accept the safe driving message. These findings are not surprising given the obvious conflict between this motivator and the notion contained within most safe driving messages, either implicitly or explicitly, that traffic laws ought to be followed. This confirms an intuitive notion: the more a person disrespects traffic laws, the more likely they are to reject messages that seek to promote them. This study also suggests that communicating this message in a negative manner is even less effective than using a positive one; in fact, the negative campaign may even strengthen their resolve to maintain current behaviour (Lennon, Rentfro, & O’Leary, 2010). Here, it could be speculated that the prominent use of negative campaigns targeting particular populations may be perceived as threatening to those individuals from the population, potentially instilling a broader perception of prejudice, and a high level of resistance to accepting the message. This is a noteworthy finding, as it may be presumed that those drivers with a heightened disrespect for the law are potentially among the most at-risk and in need of behavioural change.

This study has demonstrated linkages between the efficacy of safe driving messages and motivators of dangerous driving which could be further used to, for example, pre-test particular elements of safe driving messages with participants who have elevated levels of the motivators which authorities are seeking to change. These motivators represent variables that authorities can seek to change, as distinct from characteristics that are fixed such as drivers’ age and sex.

Limited budgets and time allocation for road safety campaigns underscore the importance of effecting the most behavioural change for the most at-risk drivers, in the most economical way. Whilst creating specific messages for each individual motivator may not be economically feasible (nor practical), identifying broad groupings of motivators and their relationship with particular demographic features would provide useful input for campaign strategies. The comprehensive statistics available on traffic incidents can be used to guide this evidence-based approach and determine which particular regions need the most effort and the best type of methods to use. Alternatively, research may reveal no easily identifiable motivational patterns in a particular area, with the cause of road traffic incidents being more related to, for example, a lack of traffic law awareness, poor road safety, or traffic “black spots”.

### Limitations and future directions

There were limitations in the design of this study. Firstly, it relied on self-report for the motivators of dangerous driving as well as current and planned driving behaviours. Previous studies have demonstrated that response acquiescence and a lack of willingness to accurately disclose driving behaviour is often present in self-report measures (af Wählberg, 2010), implying that how people respond in questionnaires about how they drive may be quite different to their actual driving habits. However, this study did confirm some intuitive relationships (e.g., the male drivers' relatively worse, and more pervasive attitudes to dangerous driving), which should add some degree of comfort regarding the accuracy of the responses. Further, previous studies have confirmed the veracity of self-report measures for driving behaviour (e.g., Lajunen & Summala, 2003). Regardless, future research should look to further validate the current findings using triangulation methods, which incorporate more objective accounts of driver behaviour (e.g., simulation studies similar to Plant, Irwin, & Chekaluk, 2017), more 'online' measures of emotional response (e.g., neuroimaging and facial coding), as well as qualitative accounts of drivers' motivations to drive dangerously and their perceptions of safe driving messages.

Another limitation was the presence of confounds within each of the safe driving messages. Whilst the messages were distinctly contrasting in their depiction of the consequences of driving behaviours (i.e., favourable or unfavourable outcomes), both messages contained elements of positive and negative valence. For example, the negative safe driving message depicted both the adverse consequences of driving dangerously (i.e., the collision with a pedestrian, which was the main focus), but also demonstrated an avoidance of these consequences by reducing speed (i.e., a positive outcome). Similarly, whilst the main focus of the positive safe driving message was to demonstrate the benefits of driving safely (e.g., a more relaxed state of mind), it also contained negative imagery associated with not doing so (e.g., being stressed out), reflecting a negative outcome. Differences in other features such as the age and sex of the protagonist and narrator, sound effects, music, and pace, mean that the valence was not the sole difference between the two messages, albeit a major one. Also, as found in previous studies and summarised by Lewis, Watson, and White (2009), there is a difference between how safe driving messages are viewed during experiments compared with that in everyday life (e.g., during a television advertisement break or on a billboard, observed repeatedly over the length of the campaign). In this experiment, the message was displayed once with a very small delay between viewing and appraisal; previous studies have demonstrated a delay between viewing safe driving messages and their benefits being realised (Lammers, 1990).

Finally, the sample in this study was heavily skewed towards female participants (approximately 72% were female). As sex is consistently found to be a factor in driving behaviour (e.g., Lewis, Watson, & White, 2008) as well as responses to safe driving messages (Lammers, 1990), the ability to generalise findings to the overall population of drivers was limited. Indeed, the current study revealed significant differences between females and males in both their actual and planned driving behaviours, as well as their motivations for dangerous driving. As a modest male sample size precluded their inclusion in the study's analyses relating to individual motivators, future researchers should look to better incorporate this group to improve our understanding of the role of sex in message impact. Further research should also attempt to add greater granularity in personal data collection, so as to better capture other pertinent social factors that may influence message impact (e.g., lifestyle factors).

### Conclusions

Dangerous driving is a social problem that can result in serious injuries, fatalities, and significant economic costs. An extensive amount of research has examined the causes of dangerous driving, and road safety campaigns designed to address them, which mostly utilise negatively valenced safe driving messages. However, less research has investigated the relative efficacy of positively valenced safe driving messages, and the role of drivers' motivations for dangerous driving in relation to message impact. The current study revealed marked differences across sex in drivers' motivations to drive dangerously, as well as their planned driving behaviours after viewing safety messages; underlining the critical role of driver sex in influencing drivers' attitudes and behaviours. Results relating to message impact revealed significantly greater response efficacy and message acceptance, and lower message rejection in the positive message group, compared to the negative message group overall. This finding suggests that there may be benefit in the use of positively valenced safety campaigns, despite the traditional dominance of negative campaigns. However, this impact was found to vary significantly as a function of drivers' age and sex, further underlining the case for consideration of individual differences in drivers' engagement with safety messages. Finally, among the female drivers, a number of motivators were observed to predict message impact in the positive and negative conditions, suggesting potential value in the leveraging of psychological individual differences in anticipating message impact, supporting the case for a more targeted approach in campaign design.

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