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Rank-ordering anti-speeding messages

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ABSTRACT

Purpose: Further explore the utility of protection motivation theory (PMT) in developing effective roadside anti-speeding messages.
Method: Via an electronic link, 81 participants holding a current Australian driver's license rated all possible pairs of 18 PMT-derived anti-speeding messages in terms of their perceived effectiveness in reducing speed for themselves, and for drivers in general.
Results: While some messages revealed third-person effects (perceived as being more relevant to drivers-in-general than to self-as-driver), others showed reverse third-person effects (perceived as being more relevant to self-as-driver than to drivers-in-general). Compared with messages based on coping appraisal components, those derived from threat appraisal PMT components (perceived severity, counter-rewards, vulnerability) were rated as being more effective, both for participants themselves as driver, and for drivers-in-general. Compared with females, males reported threat appraisal messages as being more effective for reducing speed in themselves (reverse third-person effect). Aggregate scores for the 18 messages derived from this ipsative methodology correlated modestly with those from a normative study using similarly-worded items.
Discussion: As jurisdictions globally recognize speeding as a major road safety issue, effective anti-speeding campaigns are essential. Findings added to current knowledge of PMT's efficacy as a basis for generating effective anti-speeding messages and indicated areas for future research and application.

1. Introduction

Speed-related road trauma is a global traffic issue. This experimental study expands research examining effects of theory-driven anti-speeding messages. The study's importance lies in the desirability of obtaining effective roadside anti-speeding messages as a low-cost way of addressing motorists' speeding behavior. We first consider an appropriate theoretical context for the study.

1.1. Protection motivation theory

Protection motivation theory (PMT) identifies cognitive and affective decision-making processes to explain effects of fear appeals on behaviors (Floyd et al., 2000; Maddux and Rogers, 1983; Prentice-Dunn and Rogers, 1986). Threat and coping appraisal components explain an individual's motivation to adopt either an adaptive or a maladaptive behavior (Rogers, 1975). For an individual's incentive to adopt an adaptive behavior, protection motivation mediates appraisal and behavior (Block and Keller, 1998; Milne et al., 2000). In speeding-related research, this refers to the incentive not to engage in speeding behavior (Fig. 1).

1.2. Theory-based signage and driver behavior

As a flexible low-cost intervention, roadside signage can influence driver behavior (Meis and Kashima, 2017), with effective signage campaigns often driven by psychological theory (Friemel and Bonfadelli, 2016; Scott-Parker et al., 2009). Phillips et al. (2011) meta-analysis indicated that effective road safety signage campaigns targeting speed reduction should be based on theory addressing perceived risk/threat. Studies in different countries have found evidence for PMT-based anti-speeding messages' efficacy (Cathcart and Glendon, 2016; Cauberghe et al., 2009; Glendon et al., 2018; Glendon and Walker, 2013; Kergoat et al., 2017; Plant et al., 2011; Simons-Morton et al., 2006).

Threat appeals typically represent possible negative outcomes of a maladaptive behavior (Lewis et al., 2007b). While roadside anti-speeding messages may seek to evoke fear in drivers when attempting

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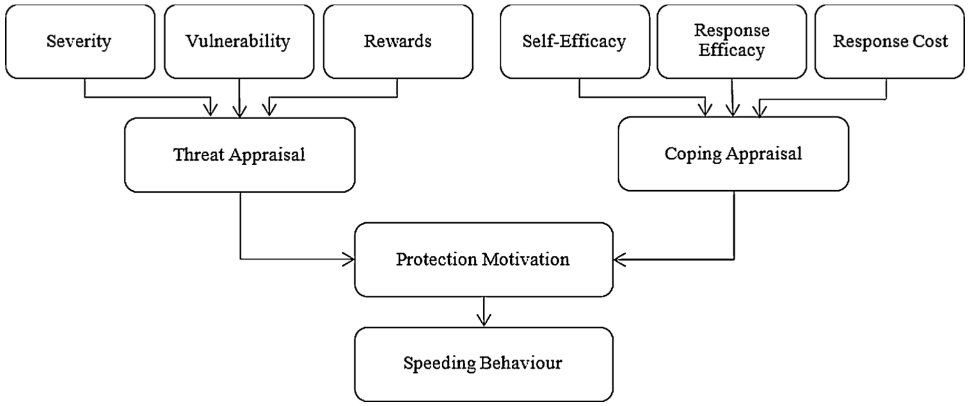

Fig. 1. Protection motivation theory and speeding behavior.

to encourage them to adopt adaptive behaviors (Maddux and Rogers, 1983), highly threatening messages conveying the possibility of serious injury or death may not be effective in reducing speeding behavior (Ben-Ari et al., 2000), particularly with young male drivers (Lewis et al., 2008, 2010). Carey et al. (2013) suggested that this may be due to a tendency to disconnect negative emotions and behavior in response to fear-based campaigns. As PMT's threat appraisal components seek to appeal to people's perceptions of threat, a fear-based response, and the potential for emotion-behavior disconnection, is alleviated (Tunner et al., 1989). When considering the impact of coping appraisal elements, if drivers perceive themselves as able to cope with the threat presented, then the maladaptive behavior is unlikely to cease (Floyd et al., 2000).

1.3. PMT and third-person effects

The third-person effect involves people considering the influence of persuasive messages on themselves and others. The classic third-person effect is an individual's tendency to perceive a message as having greater relevance to others than to themselves. A reverse third-person effect refers to a message perceived as being more relevant to oneself than to others (Davison, 1983). Third-person and reverse third-person effects were found for some messages used as stimuli in the current study (Glendon et al., 2018).

H1. Messages' perceived effectiveness will differ for self-as-driver compared with drivers-in-general.

Investigating the efficacy of PMT-derived road safety advertisements, Lewis et al. (2007a) found a gender difference in third-person effects. While males showed classic third-person effects, females perceived messages as being more relevant to their own behavior. Third-person gender effects were also found by Glendon and Walker (2013), and by Cathcart and Glendon (2016).

H2. Messages' perceived effectiveness will differ between males and females, with third-person effects expected for males and reverse third-person effects expected for females.

1.4. An ipsative methodology

To extend research on the perceived effectiveness of PMT-based anti-speeding messages in reducing driver speed, in contrast to studies using independent (e.g., normed) ratings for each stimulus message, this study adopted an ipsative methodology. This forced-choice paired-comparison approach, often used in personality testing (Bartram, 2007; Chan, 2003; Matthews and Oddy, 1997) can be a powerful way of discriminating between stimuli. It involves ranking items by comparative preference (Baron, 1996), which here involved participants comparing all possible message pair combinations in terms of effectiveness. An ipsative approach has been claimed to enhance validity and control for biases that may occur when using non-ipsative (e.g., normative) approaches (Bartram, 2007; Chan, 2003; Salgado et al., 2015), and provide better measure differentiation (Bartram, 2007).

An ipsative approach can limit potential social desirability and acquiescence response biases (Matthews and Oddy, 1997), and enhance reliability (Bowen et al., 2002), particularly in respect of a criterion variable related to actual performance (Bartram, 2007), which is a desired long-term outcome of the current study. Using this approach allowed the effectiveness of the 18 PMT-derived anti-speeding messages to be ranked to assess the relative efficacy of each anti-speeding message, thereby revealing new information about PMT's effectiveness as a basis for anti-speeding messages. Anti-speeding messages based on threat appraisal components (e.g., severity, vulnerability) have been judged more effective than coping-based messages (Cathcart and Glendon, 2016; Glendon and Walker, 2013).

H3. Threat-based messages will be more highly ranked than coping-based messages.

As approximately 60 percent of the variance in normative scores is predicted by ipsative scores on the same scales (Matthews and Oddy, 1997), moderate correlations may be expected between ipsative (current study) and normative (Glendon and Walker, 2013) scores for the same 18 messages. However, near-zero correlations can be expected for comparisons between scores based on all possible message combinations (current study) and scores for the same 18 messages constrained within each PMT component (i.e., rated ipsatively only against the other two messages representing the same PMT component, as in Glendon et al., 2018).

H4. Messages' ranked scores will be moderately correlated with equivalent scores from normative measures using the same or very similar items.

1.5. The current study

The study's main aim was to further explore PMT's utility for developing roadside anti-speeding messages. Following experimental testing, the stimuli messages were: 1) evaluated by driver focus groups, 2) approved for roadside use by professional agencies, and 3) abbreviated to fit variable message sign (VMS) format for roadside mobile trailer deployment. The criterion variables were reported comparative perceived effectiveness of each message for: 1) participant-as-driver, and 2) drivers-in-general.

2. Method

2.1. Participants

A convenience sample of 81[1] participated (range 17–50 years, *M* age = 20.65, *SD* = 5.16, 25 males). The bias towards younger drivers reflected the relatively higher risk for this driver demographic, including their greater tendency to engage in speeding behavior compared with older drivers (Chevalier et al., 2016; Kinosada and Usui, 2016; Scott-Parker et al., 2012). Open licenses were held by 24 participants, 29 held a Provisional 2 (P2) license, and 28 held a Provisional 1 (P1) license.[2]

2.2. Materials

Modified versions of the 18 PMT-derived anti-speeding messages (Glendon and Walker, 2013) were the experimental stimuli (Table 1), with every possible message pairing (153) tested separately (Appendix Table A1). All message combinations were created as roadside VMS images using Photoshop (Fig. 2).

To optimize presentation for ease of responding, pilot participants commented on stimuli layout. The final design displayed each dual-phrase message side-by-side across two simulated VMS screens, with the comparison message displayed directly beneath (Fig. 2 shows an example) to reflect the way in which messages would be viewed in a naturalistic setting. On each screen, the top and bottom messages were labelled Message A and Message B respectively. Piloting determined that participants could reasonably assess all 153 message combinations before boredom or fatigue influenced responses.

2.3. Procedure

The authors' University's Human Research Ethics Committee approved the study. Stimuli were displayed online using Survey Monkey. To control for possible order effects or response biases, the 153 message pair combinations were block randomized into three groups of 51 (labelled 1, 2, & 3). Combination sets were created based upon the six possible combinations of groups 1, 2, and 3. Access control ensured that similar numbers of participants completed each set. Participants accessed one of the sets from a link distributed via Facebook and the authors' school's research participant pool. Upon accessing the link, participants viewed a consent sheet outlining the task, and informing them that their answers were confidential. Consent was indicated when a participant commenced the task, which participants completed at their own pace using their own devices.

When considering each message combination participants responded to two questions. The first asked, "Which of these two messages would be most likely to result in *you* reducing your speed if you saw it while driving your regular vehicle?" The second asked, "In your opinion, which of these two messages would be most effective in getting *drivers in general* to reduce their speed while driving?" Participants were prompted to select either Message A or Message B in response to each question. Each combination and corresponding questions were displayed on one page, and participants were prompted to progress to the next combination by clicking the 'Next' button. After completing two-thirds of the task, a 5-minute activity (watching a short video) was offered for participants wishing to take a break from responding. Participants typically took less than an hour to complete the task, after which they provided their age, gender, and license type. Participating first-year students were granted one hour's course credit, and all participants were invited to enter a cash prize draw. Following data collection, three winners drawn at random each received a $50 cash prize.

2.4. Data analysis

Analyses used IBM SPSS v.24.0 and Excel 2016. Data screening confirmed the absence of patterned responses (e.g., stereotypical answers), and no missing data. Histograms and Q-Q plots with non-significant Kolmogorov-Smirnov Tests for all variables indicated normal distributions. Skewness and kurtosis cut-offs also showed limited departures from normality for all variables. Non-significant Levene's Test indicated that the homogeneity of variance assumption had been met for all variables.

3. Results

Each message had two aggregate scores (self-as-driver, drivers-in-general) each being the mean number of times it was selected over the other 17 messages. To test whether perceived effectiveness of the messages differed for self-as-driver compared with drivers-in-general (H1), paired-samples *t*-tests compared scores' mean difference for each message. Positive *t*-values indicated a reverse third-person effect (self-as-driver mean higher), whilst negative *t*-values represented a classic third-person effect (drivers-in-general mean higher). Appendix Table A2 shows differences between means for self-as-driver and drivers-in-general, and *t*-values for the 18 messages rank-ordered by effect size (*p*-values in parentheses).

Fig. 3 charts the nine messages showing third-person effects (drivers-in-general mean higher), with three having small to medium effects (.02–.05) and small *p*-values: Message#13 (BE WITHIN THE SPEED LIMIT/AND YOU WON'T GET A PENALTY), #8 (ARE YOU SPEEDING?/WHAT ABOUT THE PENALTY?), and #5 (SPEED CAMERAS ANYWHERE/ WHAT IF YOU ARE CAUGHT?). Fig. 4 shows the nine messages with reverse third-person effects (self-as-driver mean higher), with three having small to medium effects and small *p*-values: Message#2 (KEEP YOUR PASSENGER SAFE/ REDUCE YOUR SPEED), #7 (SPEEDING?/SPEED CAN HURT YOU & OTHERS), and #11 (YOU CAN PREVENT HARM/BE WITHIN THE SPEED LIMIT). Participants judged that while messages emphasizing harm that might be caused by speeding would be most effective for themselves-as-driver, for drivers-in-general messages highlighting penalties involved in speeding were considered most effective

To test whether perceived message effectiveness differed between males and females (H2), a 2 (Gender: Male, Female) × 2 (Perceived effectiveness for self-as-driver: Threat appraisal, Coping appraisal) × 2 (Perceived effectiveness for drivers-in-general: Threat appraisal, Coping appraisal) ANOVA tested whether gender differences existed in reported perceived message effectiveness. Criterion variables were the number of times that participants selected each of the 18 anti-speeding messages as being more effective than another: a) for themselves-as-driver, and b) for drivers-in-general. Table 2 shows descriptive statistics for the threat and coping appraisal messages' (9 of each type) aggregated scores for all participants.

Gender effects (Hedges' *g* for unequal sample sizes) were all $< .2$ with all *p*-values $< .4$. As the sample female–male ratio violated the 1:1.5 maximum for ANOVA group sizes, 25 females with similar ages and license types were matched with each of the 25 male participants (sub-sample $n = 50$), as far as possible within each set (male–female pairings had responded to the stimuli in the same order). While a main effect was found for perceived effectiveness for drivers-in-general, $F(1,48) = 13.47$, $p = .001$, $\eta_p^2 = .219$, there was no main effect for perceived effectiveness for self, $F(1,48) = 0.19$, $p = .662$, nor for the interactions. Fig. 5 shows perceived effectiveness of threat and coping appraisal message aggregate scores for drivers-in-general. Both male and female participants perceived threat appraisal messages to be more effective than coping appraisal messages for drivers-in-general. Fig. 6

[1] Adequate sample size for expected range of effect sizes (Hair et al., 1998).

[2] Queensland State licensing criteria: http://www.tmr.qld.gov.au/licensing.aspx.

Table 1
Anti-speeding messages.

PMT component	Threat Appraisal Messages		
Severity	KEEP YOURSELF SAFE / REDUCE YOUR SPEED	KEEP YOUR PASSENGER SAFE / REDUCE YOUR SPEED	KEEP YOUR MATES SAFE / REDUCE YOUR SPEED
Vulnerability	NO ONE IS SAFE SPEEDING / SPEED CAMERAS ANYWHERE	SPEED CAMERAS ANYWHERE / WHAT IF YOU ARE CAUGHT?	SPEEDING? / SPEED CAMERAS ANYWHERE
Counter-rewards	SPEEDING? / SPEED CAN HURT YOU AND OTHERS	ARE YOU SPEEDING? / WHAT ABOUT THE PENALTY?	ARE YOU SPEEDING? / WANT TO RISK YOUR LICENSE?
	Coping Appraisal Messages		
Self-efficacy	YOU CAN STAY SAFE / DRIVE WITHIN THE SPEED LIMIT	YOU CAN PREVENT HARM / BE WITHIN THE SPEED LIMIT	YOU CAN KEEP A MATE SAFE / BE WITHIN THE SPEED LIMIT
Response efficacy	BE WITHIN THE SPEED LIMIT…/ …AND YOU WON'T GET A PENALTY	KEEP THE ROAD SAFE / BE WITHIN THE SPEED LIMIT	KEEP A MATE SAFE / BE WITHIN THE SPEED LIMIT
Response cost	LATE? / SPEEDING IS TOO RISKY	RATHER BE LATE THAN… / … SPEED & NEVER ARRIVE	SPEEDING IS TOO RISKY / BETTER TO ARRIVE LATE

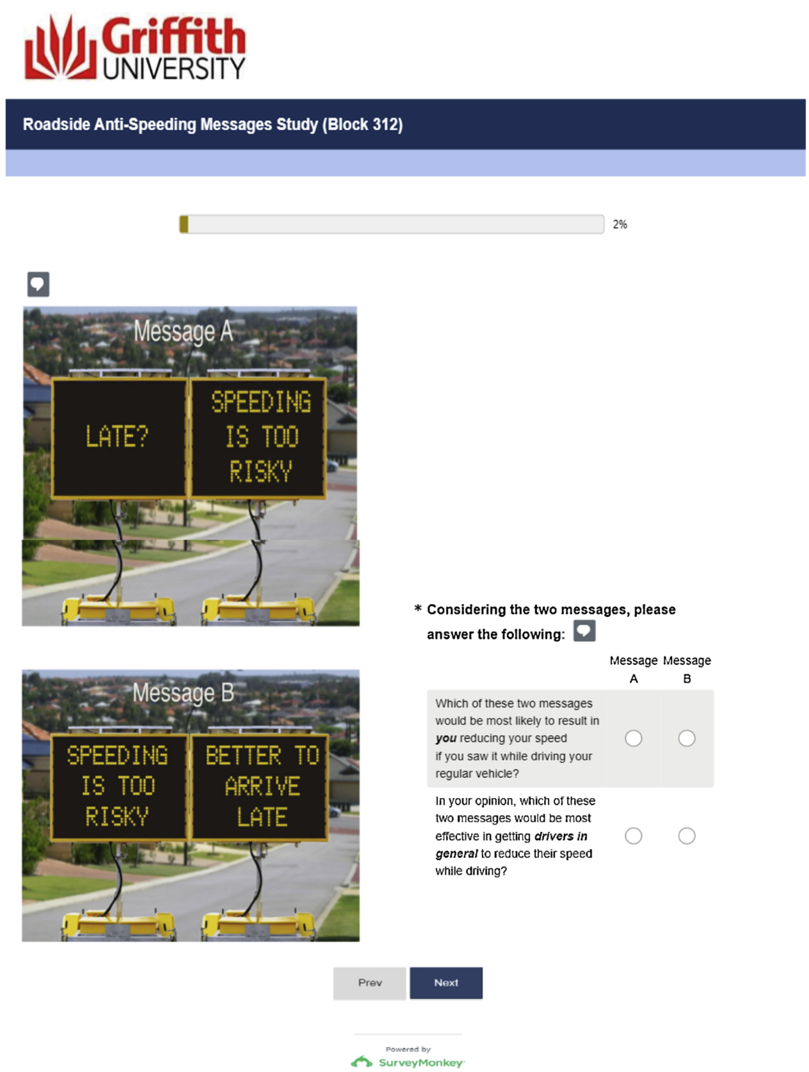

Fig. 2. Sample stimulus screen.

shows aggregate scores for all 18 messages for the questions pertaining to self-as-driver, and for drivers-in-general. In both cases, male and female participants responded similarly in terms of message perceived effectiveness.

To explore H3, differences between aggregate mean scores for the three messages derived from each of the six PMT components were compared. The two criterion variables were the total number of times that these participants had selected each of the 18 anti-speeding messages as being more effective than another: a) for themselves-as-driver, and b) for drivers-in-general. Table 3 shows aggregate mean scores for the three messages representing each of the six PMT components.

Messages representing the three threat appraisal PMT components

Fig. 3. Classic third-person effects (data from Table A2).

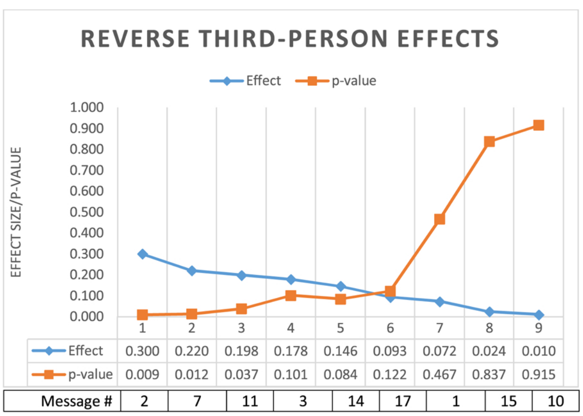

Fig. 4. Reverse third-person effects (data from Table A2).

Table 2
Aggregated message scores by appraisal type and gender ($N = 81$).

Message type	Females' means (*SD*) (*N = 56*)	Males' means (*SD*) (*N = 25*)
Threat appraisal messages (Self-as-driver)	83.70 (11.21)	81.60 (10.43)
Coping appraisal messages (Self-as-driver)	69.30 (11.2)	71.40 (10.43)
Threat appraisal messages (Drivers-in-general)	82.89 (10.02)	83.64 (11.52)
Coping appraisal messages (Drivers-in-general)	70.04 (10.02)	69.32 (11.52)

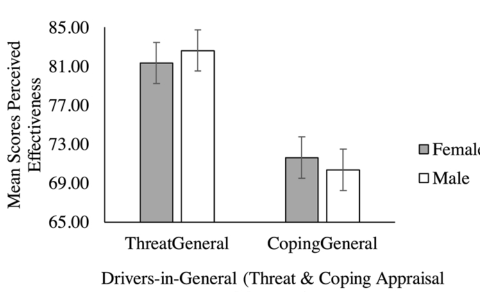

Fig. 5. Perceived effectiveness of threat and coping appraisal messages – drivers-in-general.

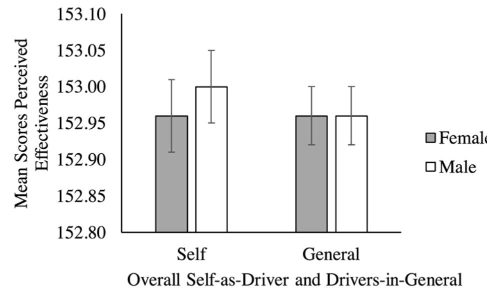

Fig. 6. Overall perceived effectiveness of messages for self-as-driver and drivers-in-general.

Table 3
Mean scores for messages derived from each PMT component ($n = 50$).

PMT Component (Appraisal type)	*Mean (SD)*
Severity (Threat)	57.20 (14.12)
Counter-rewards (Threat)	54.94 (11.65)
Vulnerability (Threat)	51.82 (16.55)
Self-efficacy (Coping)	49.76 (12.66)
Response efficacy (Coping)	48.26 (9.75)
Response cost (Coping)	43.96 (17.67)

were more highly ranked for effectiveness than were messages representing the three coping appraisal components, supporting H3. Of the six aggregated sets of three messages, those representing severity (threat appraisal), meant that this was the highest ranked component overall, while the three messages representing response cost (coping appraisal) were lowest ranked.

To further investigate possible differences between the PMT components in relation to gender and driver target, a 2 (Gender: Male, Female) × 2 (Target: Self-as-driver, Drivers-in-general) × 6 (Message type: Severity, Vulnerability, Counter-rewards, Self-efficacy, Response efficacy, Response cost) ANOVA was run. The equal gender groups sample ($n = 50$) was used for these analyses. A small main effect for PMT component, $F(1,48) = 4.78$, $p < .001$, $\eta_p^2 = .091$, indicated small differences between at least some PMT components from which the messages were derived. However, there was no effect between all three variables, $F(1,48) = 1.29$, $p = .267$, nor for the two-way interactions between gender and PMT component, $F(1,48) = 0.68$, $p = .639$, nor for question type and PMT component, $F(1,48) = 0.46$, $p = .806$.

To identify where differences might exist, 15 paired-samples *t*-tests compared the means of each PMT component, represented by the aggregate score of its three message ratings (overall mean = 17 × 3 = 51). Appendix Table A3 shows aggregate scores for the six PMT components, and *t*-values for the 15 comparisons rank-ordered by effect size. Fig. 7 displays effects sizes and *p*-values for the 15 PMT-component comparisons.

To investigate further which individual messages were perceived to be most effective for participants themselves, and for drivers-in-general, means for each message were rank ordered. Table 4 shows the messages rank ordered for self-as-driver, and Table 5 shows the messages rank ordered for drivers-in-general. One-way ANOVAs investigating differences between aggregate self-as-driver and for drivers-in-general scores showed tiny effects, reflecting similarities between rated effectiveness of messages for self-as-driver and for drivers-in-general (i.e., very similar message rankings in both conditions).

A critical question for these ipsatively generated data sets, is "Did they differ from a randomly generated data set?" To determine whether perceived effectiveness ratings might be attributed to randomly allocated ratings across the sample, an 18 ("messages") × 81 ("participants") matrix of random numbers with minimum set at zero (i.e., minimum possible score for any message), and maximum set at 17 (i.e.,

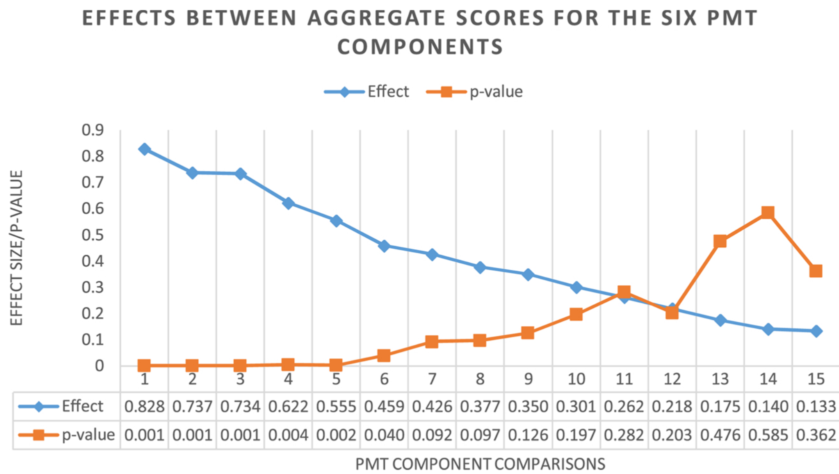

Fig. 7. Effects between aggregate scores for the 6 PMT components (data from Table A3).

Table 4
PMT-derived anti-speeding messages rank-ordered by mean score: Perceived effectiveness for self-as-driver (N = 81).

Rank	Message	PMT Component	Mean (SD)
1	KEEP YOUR MATES SAFE / REDUCE YOUR SPEED	Severity	10.67 (3.35)
2	KEEP YOUR PASSENGER SAFE / REDUCE YOUR SPEED	Severity	10.15 (3.43)
3	SPEEDING? / SPEED CAN HURT YOU & OTHERS	Counter-rewards	10.01 (3.31)
4	RATHER BE LATE…/ …THAN SPEED & NEVER ARRIVE	Response cost	9.90 (4.69)
5	ARE YOU SPEEDING? / WANT TO RISK YOUR LICENSE?	Counter-rewards	9.51 (3.41)
6	KEEP A MATE SAFE / BE WITHIN THE SPEED LIMIT	Response efficacy	9.35 (3.49)
7	YOU CAN KEEP A MATE SAFE / BE WITHIN THE SPEED LIMIT	Self-efficacy	9.23 (3.31)
8	NO ONE IS SAFE SPEEDING / SPEED CAMERAS ANYWHERE	Vulnerability	9.00 (3.35)
9	SPEED CAMERAS ANYWHERE / WHAT IF YOU ARE CAUGHT?	Vulnerability	8.69 (3.64)
10	SPEEDING? / SPEED CAMERAS ANYWHERE	Vulnerability	8.67 (4.14)
11	YOU CAN PREVENT HARM / BE WITHIN THE SPEED LIMIT	Self-efficacy	8.64 (3.37)
12	ARE YOU SPEEDING? / WHAT ABOUT THE PENALTY?	Counter-rewards	8.20 (3.01)
13	KEEP YOURSELF SAFE / REDUCE YOUR SPEED	Severity	8.16 (2.91)
14	KEEP THE ROAD SAFE / BE WITHIN THE SPEED LIMIT	Response efficacy	7.14 (3.76)
15	SPEEDING IS TOO RISKY / BETTER TO ARRIVE LATE	Response cost	6.78 (3.34)
16	BE WITHIN THE SPEED LIMIT AND…/ …YOU WON'T GET A PENALTY	Response efficacy	6.68 (2.72)
17	YOU CAN STAY SAFE / DRIVE WITHIN THE SPEED LIMIT	Self-efficacy	6.30 (3.21)
18	LATE? / SPEEDING IS TOO RISKY	Response cost	5.94 (3.33)

Table 5
PMT-derived anti-speeding messages rank-ordered by mean score: Perceived effectiveness for drivers-in-general (N = 81).

Rank	Message	PMT Component	Mean (SD)
1	KEEP YOUR MATES SAFE / REDUCE YOUR SPEED	Severity	10.09 (3.16)
2	ARE YOU SPEEDING? / WANT TO RISK YOUR LICENSE?	Counter-rewards	10.04 (3.16)
3	RATHER BE LATE…/ …THAN SPEED & NEVER ARRIVE	Response cost	9.47 (4.54)
4	SPEED CAMERAS ANYWHERE / WHAT IF YOU ARE CAUGHT?	Vulnerability	9.41 (3.61)
5	SPEEDING? / SPEED CAN HURT YOU & OTHERS	Counter-rewards	9.31 (3.04)
6	KEEP A MATE SAFE / BE WITHIN THE SPEED LIMIT	Response efficacy	9.27 (3.31)
7	YOU CAN KEEP A MATE SAFE / BE WITHIN THE SPEED LIMIT	Self-efficacy	9.25 (3.02)
8	NO ONE IS SAFE SPEEDING / SPEED CAMERAS ANYWHERE	Vulnerability	9.20 (3.05)
9	KEEP YOUR PASSENGER SAFE / REDUCE YOUR SPEED	Severity	9.14 (3.32)
10	SPEEDING? / SPEED CAMERAS ANYWHERE	Vulnerability	9.02 (3.67)
11	ARE YOU SPEEDING? / WHAT ABOUT THE PENALTY?	Counter-rewards	8.98 (3.13)
12	YOU CAN PREVENT HARM / BE WITHIN THE SPEED LIMIT	Self-efficacy	8.01 (2.97)
13	KEEP YOURSELF SAFE / REDUCE YOUR SPEED	Severity	7.95 (2.95)
14	BE WITHIN THE SPEED LIMIT AND…/ …YOU WON'T GET A PENALTY	Response efficacy	7.74 (3.17)
15	SPEEDING IS TOO RISKY / BETTER TO ARRIVE LATE	Response cost	6.99 (3.58)
16	KEEP THE ROAD SAFE / BE WITHIN THE SPEED LIMIT	Response efficacy	6.62 (3.37)
17	YOU CAN STAY SAFE / DRIVE WITHIN THE SPEED LIMIT	Self-efficacy	6.27 (2.91)
18	LATE? / SPEEDING IS TOO RISKY	Response cost	6.20 (3.48)

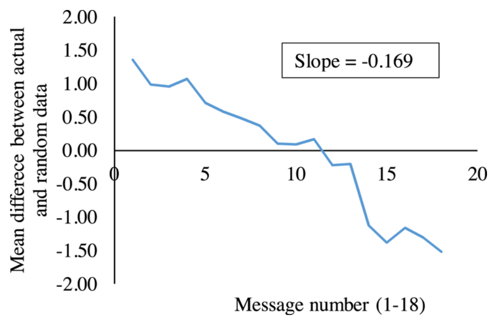

Fig. 8. Differences between ranked effectiveness for self-as-driver and random data ranks.

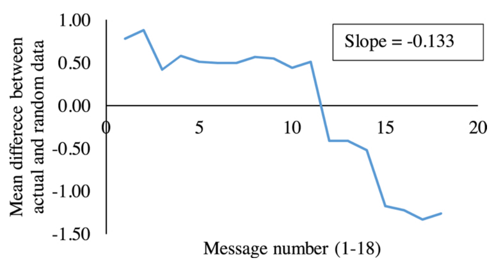

Fig. 9. Differences between ranked effectiveness for drivers-in-general and random data ranks.

maximum possible score for any message), was generated using Microsoft Excel's RANDBETWEEN function. Appendix Table A4 shows a sample of such random data. As the Excel F9 key function makes it possible to generate an extremely large number of random matrices, a matrix was generated that had almost the same aggregate total as each of the experimental participants' total ratings, which was equal to the total number of message comparisons made by each participant (i.e., 153).

Appendix Table A5 shows rank-ordered means and *SD*s for the random data by "message" (row data), alongside the rank-ordered experimentally generated message means and *SD*s for self-as-driver, and for drivers-in-general. The means (8.5) for all three columns are identical (i.e., = 17/2), indicating that the number of experimental participants ($N = 81$) meant that it was possible to generate a random matrix of data with the same mean. The totals for these columns are almost identical – with rounding, both the random data aggregate means and both experimentally generated aggregate means equal 153, which is the number of judgments made by each participant (i.e., the number of possible pairings of 18 messages = 18 × 17/2).

The standard errors of the three *SD* columns of Table 9 differ, with the random data having a larger *SE* (5.17) than both the self-as-driver data (3.43), and the drivers-in-general data (3.30). This indicates that the randomly generated data had greater variance per "message" than did either of the experimentally derived data sets. This would be expected if participants had made their judgments based on message content rather than making random judgments about each message pairing. Table A5 also shows differences between the randomly generated means, and respectively for the means for self-as-driver, and for drivers-in-general. Both these column means are zero, indicating that all difference variance has been extracted. This is because any ipsatively generated data set is bounded by all possible stimulus pairings. These are displayed graphically in Fig. 8, which illustrates differences between mean message scores for self-as-driver and the ranked random data means, and in Fig. 9, which shows the equivalent graph for differences between drivers-in-general, and the (same) ranked randomly generated mean scores. The ordinates represent the respective difference scores, and the abscissa indicate the rank-ordered message numbers (which differ for each data set).

A horizontal line parallel with (or identical with) the abscissa would have indicated no variation between participants' judgments and an equivalent matrix of randomly generated data. The slopes in Figs. 8 and 9, as well as the comparative message variance, as represented by the *SD*s and *SE*s for the respective means in Table A5, indicated that rankings derived from participants' judgments were non-random.

To determine the extent to which the ipsative data from the current study were correlated with normatively derived data (Glendon and Walker, 2013), and the constrained data (Glendon et al., 2018) from the comparatively derived anti-speeding messages (H4), the correlation matrix in Table 6 was generated.

Common method variance significantly inflated intra-study correlations between self-as-driver and drivers-in-general measures within each study (i.e., Table 6 items 1 & 2, 3 & 4, 5 & 6). Moderate correlations were found between current study and Glendon and Walker self-as-driver ($r = .65$, $p = .004$), and for drivers-in-general ($r = .51$, $p = .031$) measures. Despite the restricted scoring range for Glendon and Walker's (2013) items and wording changes for some items between that study and the current study, normative and ipsative measures of the same scale items were modestly correlated, supporting H4. As Glendon et al.'s (2018) study means and *SD*s were constrained within each PMT component, comparisons with the other two studies were not predicted to correlate.

4. Discussion

Building on previous research, the study's main aim was to reveal more about the extent to which PMT could be an effective basis for developing roadside anti-speeding messages. The findings met this aim,

Table 6
Three-study correlation matrix.

Study/Context (*N*)	*Mean*	*SD*	2	3	4	5	6
1. Current study/ Self-as-driver (81)	8.50	1.41	.92 (< .001)	.65 (.004)	.54 (.020)	.08 (.745)	.29 (.247)
2. Current study/ Drivers-in-general	8.50	1.26		.60 (.008)	.51 (.031)	.15 (.562)	.39 (.114)
3. Glendon & Walker/ Self-as-driver (83)	2.69	0.37			.97 (< .001)	−.12 (.643)	.11 (.665)
4. Glendon & Walker/ Drivers-in-general	2.50	0.41				−.19 (.446)	−.00 (.997)
5. Glendon et al./ Self-as-driver (34)	2.00	0.25					.59 (.010)
6. Glendon et al./ Drivers-in-general	2.00	0.24					

Note: *p*-values in parentheses.

with new information generated using a novel ipsative methodology.

That perceived message effectiveness would differ for self-as-driver compared with drivers-in-general (H1) was partially supported. Small to medium mean difference effects were found for self-as-driver and drivers-in-general for six of the 18 messages, revealing both third-person effects (3 messages perceived as more effective for drivers-in-general), and reverse third-person effects (3 messages perceived as more effective for self-as-driver). However, participants found 12 of the 18 messages to be similarly as effective for themselves and for drivers-in-general, potentially supporting PMT as a robust basis for developing anti-speeding messages. As for any experimental study, effects can only be sample-specific.

The main effect for drivers-in-general indicated differences between messages representing aggregated threat and coping appraisal components. Participants ranked threat appraisal messages as being highly effective in terms of reducing speed for drivers-in-general. A main effect for PMT component indicated differences between the six components from which the messages were derived. These were between aggregated message scores for severity and aggregated scores for messages representing all three coping appraisal components. Differences were also found between aggregated counter-rewards message scores, and those for messages representing both response efficacy and response cost, and between aggregated vulnerability message scores and those for response cost. Overall, messages representing threat-appraisal PMT components were perceived as being more effective than those representing coping appraisal components (H3).

Ranking individual messages provided further discrimination for the effectiveness of particular messages. The severity-derived message: KEEP YOUR MATES SAFE / REDUCE YOUR SPEED, was ranked as being the most effective in reducing speed, both for self-as-driver, and for drivers-in-general. The message judged as being least effective at reducing speed for both self-as-driver and for drivers-in-general was derived from the response cost component: LATE? / SPEEDING IS TOO RISKY. The rank order of the 18 messages for both self-as-driver and for drivers-in-general reflected these aggregated patterns, with messages derived from severity and counter-rewards components being ranked among the highest. Further differentiation of PMT message components added to what was known about PMT's utility in anti-speeding signage campaigns, possibly indicating which messages could be particularly effective in roadside campaigns.

4.1. Ipsative approach

The ipsative methodology used to investigate PMT's effectiveness in the context of anti-speeding messages differed from most previously used measures. Judging paired messages as comparative preferences permitted a more discriminatory overall ranking than traditional response scale ratings, because every message was compared with every other message (153 comparisons). Potential benefits of this approach include identifying which individual messages might be comparatively more effective than others in field studies, and in PMT-based anti-speeding roadside campaigns.

Comparing differences between mean message scores for both self-as-driver and drivers-in-general with randomly generated scores provided further rationale for an ipsative approach. Experimentally-derived scores to the two target questions (self-as-driver, and drivers-in-general) differed from an equivalent random number matrix, generated with the same maximum and minimum possible values, which indicated that the forced-choice approach effectively controlled for the potential of random rankings. Non-ipsative approaches to responding, including rating individual messages separately in terms of effectiveness, potentially allows for floor or ceiling effects (Hontangas et al., 2015). If all messages are rated towards scale extremes, which is possible with normative measures, then it becomes difficult to determine the efficacy of any particular message, and to discriminate between messages. An ipsative approach provided responses to the messages that were robust to the possible occurrence of such biases, allowing for a useful comparative-based analysis of individual message effectiveness.

4.2. Theoretical contributions

Findings added to the general efficacy of using theoretically-based stimuli in addressing potentially risky driving behaviors, in this case speeding. Previous research indicated a need for portraying an element of risk or threat perception in theory-based anti-speeding campaigns. Study findings highlighted the importance of threat perception in such campaigns, as messages representing PMT's threat appraisal component were consistently ranked as most effective in reducing speed, both for self-as-driver and for drivers-in-general. Messages that raised awareness of an individual's perception of the severity of speeding consequences were perceived to be the most effective.

Previous PMT speeding-related research found differences between perceived effectiveness of anti-speeding messages for self-as-driver compared with drivers-in-general. However, current study findings indicated that overall, the messages were not perceived to be more effective for one condition over another. This might indicate a more generic effect for message effectiveness, with participants rating some messages as more effective in reducing their own speed when driving, and others as more effective in reducing speed for drivers-in-general. This finding differs from that found by Glendon and Walker (2013), suggesting an addition to current knowledge of the perceived efficacy of the PMT-derived messages when considering self-as-driver versus drivers-in-general. The suggestion from personality research that normative and ipsative study results using the same scale should be combined (Bartram, 2007; Matthews and Oddy, 1997) to address real-world performance issues – in this case speeding – could apply here.

As no gender differences in judgments were found, findings did not support H2, which proposed that males would show third-person effects, while reverse third-person effects would be revealed for females. Male and female participants perceived the messages to be approximately equally effective for themselves-as-driver as for drivers-in-general. However, third-person and reverse third-person effects might have been moderated by message type. For example, young males typically reporting greater engagement in risky driving behaviors (Rhodes and Pivik, 2011) might suggest that a higher perception of effectiveness for threat appraisal messages could validate using messages based on this PMT component for this demographic. Further experimental and field research might investigate this possibility.

Despite previous findings suggesting that females would perceive coping appraisal messages as being more effective for themselves, this was not found in the current study. However, female participants appeared to perceive coping appraisal messages to be most effective for reducing speed among drivers-in-general. Further experimental research into the perceived effectiveness of threat and coping appraisal messages may provide a greater understanding of why this effect occurred in young female participants rather than the expected reverse third-person effect.

Overall, the study contributed new knowledge about PMT in the context of speeding behaviors. Differences previously observed between effectiveness for self-as-driver and for drivers-in-general were not found, nor were some expected third-person and reverse third-person effects. This may indicate that these effects are not always consistent when PMT is applied to anti-speeding campaigns. Findings also highlighted the relative efficacy of individual messages representing PMT's threat appraisal component in reducing driver speed, demonstrating support for developing threat-derived messages for road safety campaigns. Severity and counter-rewards components were particularly effective.

4.3. Practical applications

Many jurisdictions incorporate a strategy of reducing road trauma by using effective approaches to encourage road rules compliance. To reduce speeding, anti-speeding campaigns that are effective for a wide range of driver demographics are critical. PMT has potential utility as a basis for anti-speeding roadside campaigns. Rank ordering the perceived effectiveness of 18 messages for both self-as-driver and drivers-in-general allowed for response patterns across both conditions to be determined. The highest scoring messages for both conditions may be particularly efficacious if used in roadside signage campaigns.

Should any jurisdiction decide to make use of PMT or similar theoretical approaches as a basis for an anti-speeding roadside signage campaign, the efficacy of theoretically-derived messages should be field-tested before being implemented. Although some PMT components and the messages developed from such components have been highlighted as being efficacious in the current research and in other studies, little is known about their roadside effects. Moreover, studies investigating PMT's role in anti-speeding campaigns have focused mainly on young drivers. While the current study did not restrict age range, as a convenience sample it comprised mainly young drivers, suggesting a need to assess perceived effectiveness across a wider age range. Field study assessment is essential to confirm the efficacy of PMT-based messages in roadside anti-speeding campaigns. Since preparing the current paper, such a field study has been conducted (Glendon and Lewis, 2019).

4.4. Limitations

The relatively low proportion of males sampled was a limitation. Assessing third-person effects in unequal gender groups limited power and potentially impaired interpretability (Wetcher-Hendricks, 2011). While this issue was addressed by forming a smaller sample with matched males and females for some analyses, this was at the cost of reduced power. Future research would ideally assess message effectiveness in samples with a more equal gender balance and a wider age range. Another potential limitation was the unsupervised online distribution of the message rating task. Allowing participants to access the task in their own time and to complete it at their own pace meant that, despite extensive pilot-testing, several factors could have influenced responses (e.g., distraction, fatigue, boredom).

4.5. Implications and future directions

The findings offer both theoretical and practical implications. The results provided a greater insight into the role of PMT in anti-speeding roadside signage campaigns and strengthened support for theory inclusion. That some hypothesized effects were unsupported by the findings provides opportunities for further research into these effects. An ipsative approach provided new insight into the effectiveness of individual messages and the PMT components from which they were derived.

In relation to the practicality of the findings, greater understanding of the effects that threat and coping appraisal messages have upon drivers should be of use when developing anti-speeding signage campaigns. Ultimately, the effectiveness of PMT-derived messages needs to be assessed beyond experimental conditions to establish the theory's role in naturalistic contexts. Presenting effective PMT-derived anti-speeding messages via roadside VMS may help to reduce speeding.

The aim of further establishing PMT's effectiveness as a basis for anti-speeding roadside messages was met. Study findings usefully add to current knowledge on using PMT in road safety signage. The findings also offer opportunities for researchers to further explore the nature of some of the effects, and highlight the need to assess the effectiveness of PMT-derived anti-speeding messages in naturalistic settings, such as roadside VMS.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A

Table A1
Paired combinations (N = 153) of 18 PMT-derived anti-speeding messages.

#	Message	To be compared with message number….
1	KEEP YOURSELF SAFE / REDUCE YOUR SPEED	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 (n = 17)
2	KEEP YOUR PASSENGER SAFE / REDUCE YOUR SPEED	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 (n = 16)
3	KEEP YOUR MATES SAFE / REDUCE YOUR SPEED	4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 (n = 15)
4	NO ONE IS SAFE SPEEDING / SPEED CAMERAS ANYWHERE	5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 (n = 14)
5	SPEED CAMERAS ANYWHERE / WHAT IF YOU ARE CAUGHT?	6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 (n = 13)
6	SPEEDING? / SPEED CAMERAS ANYWHERE	7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 (n = 12)
7	SPEEDING? / SPEED CAN HURT YOU & OTHERS	8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 (n = 11)
8	ARE YOU SPEEDING? / WHAT ABOUT THE PENALTY?	9, 10, 11, 12, 13, 14, 15, 16, 17, 18 (n = 10)
9	ARE YOU SPEEDING? / WANT TO RISK YOUR LICENSE?	10, 11, 12, 13, 14, 15, 16, 17, 18 (n = 9)
10	YOU CAN STAY SAFE / DRIVE WITHIN THE SPEED LIMIT	11, 12, 13, 14, 15, 16, 17, 18 (n = 8)
11	YOU CAN PREVENT HARM / BE WITHIN THE SPEED LIMIT	12, 13, 14, 15, 16, 17, 18 (n = 7)
12	YOU CAN KEEP A MATE SAFE / BE WITHIN THE SPEED LIMIT	13, 14, 15, 16, 17, 18 (n = 6)
13	BE WITHIN THE SPEED LIMIT…/…AND YOU WON'T GET A PENALTY	14, 15, 16, 17, 18 (n = 5)
14	KEEP THE ROAD SAFE / BE WITHIN THE SPEED LIMIT	15, 16, 17, 18 (n = 4)
15	KEEP A MATE SAFE / BE WITHIN THE SPEED LIMIT	16, 17, 18 (n = 3)
16	LATE? / SPEEDING IS TOO RISKY	17, 18 (n = 2)
17	RATHER BE LATE THAN…/…SPEED & NEVER ARRIVE	18 (n = 1)
18	SPEEDING IS TOO RISKY / BETTER TO ARRIVE LATE	–

Table A2
Means and effect sizes (self-as-driver vs. drivers-in-general) for 18 anti-speeding messages ($N = 81$).

Message	Question type	Mean (SD)	Mean difference	t	Cohen's d (p)
13. BE WITHIN THE SPEED LIMIT…/…AND YOU WON'T GET A PENALTY	Self-as-driver Drivers-in-general	6.68 (2.72) 7.74 (3.17)	−1.06	−3.51	0.359 (.001)
2. KEEP YOUR PASSENGER SAFE / REDUCE YOUR SPEED	Self-as-driver Drivers-in-general	10.15 (3.43) 9.14 (3.32)	1.01	2.67	0.300 (.009)
8. ARE YOU SPEEDING? / WHAT ABOUT THE PENALTY?	Self-as-driver Drivers-in-general	8.20 (3.01) 8.98 (3.13)	−0.78	−2.31	0.254 (.024)
7. SPEEDING? / SPEED CAN HURT YOU & OTHERS	Self-as-driver Drivers-in-general	10.01 (3.31) 9.31 (3.04)	0.70	2.58	0.220 (.012)
5. SPEED CAMERAS ANYWHERE / WHAT IF YOU ARE CAUGHT?	Self-as-driver Drivers-in-general	8.69 (3.64) 9.41 (3.61)	−0.72	−2.23	0.199 (.028)
11. YOU CAN PREVENT HARM / BE WITHIN THE SPEED LIMIT	Self-as-driver Drivers-in-general	8.64 (3.37) 8.01 (2.97)	0.63	2.12	0.198 (.037)
3. KEEP YOUR MATES SAFE / REDUCE YOUR SPEED	Self-as-driver Drivers-in-general	10.67 (3.35) 10.09 (3.16)	0.58	1.66	0.178 (.101)
9. ARE YOU SPEEDING? / WANT TO RISK YOUR LICENSE?	Self-as-driver Drivers-in-general	9.51 (3.41) 10.04 (3.16)	−0.53	−1.28	0.161 (.203)
14. KEEP THE ROAD SAFE / BE WITHIN THE SPEED LIMIT	Self-as-driver Drivers-in-general	7.14 (3.76) 6.62 (3.37)	0.52	1.75	0.146 (.084)
17. RATHER BE LATE THAN…/…SPEED & NEVER ARRIVE	Self-as-driver Drivers-in-general	9.90 (4.69) 9.47 (4.54)	0.43	1.56	0.093 (.122)
6. SPEEDING? / SPEED CAMERAS ANYWHERE	Self-as-driver Drivers-in-general	8.67 (4.14) 9.02 (3.67)	−0.36	−1.01	0.090 (.318)
16. LATE? / SPEEDING IS TOO RISKY	Self-as-driver Drivers-in-general	5.94 (3.33) 6.20 (3.48)	−0.26	−0.96	0.076 (.340)
1. KEEP YOURSELF SAFE / REDUCE YOUR SPEED	Self-as-driver Drivers-in-general	8.16 (2.91) 7.95 (2.95)	0.21	0.73	0.072 (.467)
4. NO ONE IS SAFE SPEEDING / SPEED CAMERAS ANYWHERE	Self-as-driver Drivers-in-general	9.00 (2.96) 9.20 (3.05)	−0.20	−0.74	0.067 (.461)
18. SPEEDING IS TOO RISKY / BETTER TO ARRIVE LATE	Self-as-driver Drivers-in-general	6.78 (3.34) 6.99 (3.58)	−0.21	−0.78	0.061 (.437)
15. KEEP A MATE SAFE / BE WITHIN THE SPEED LIMIT	Self-as-driver Drivers-in-general	9.35 (3.49) 9.27 (3.31)	0.07	0.21	0.024 (.837)
10. YOU CAN STAY SAFE / DRIVE WITHIN THE SPEED LIMIT	Self-as-driver Drivers-in-general	6.30 (3.21) 6.27 (2.91)	0.03	0.11	0.010 (.915)
12. YOU CAN KEEP A MATE SAFE / BE WITHIN THE SPEED LIMIT	Self-as-driver Drivers-in-general	9.23 (3.31) 9.25 (3.20)	−0.01	−0.04	0.006 (.969)

Table A3
Mean differences between aggregate scores for the six PMT components ($n = 50$).

Rank	PMT component comparisons	Mean (SD)	Mean difference	t	Cohen's d (p)
1	Severity Response cost	57.20 (14.12) 43.96 (17.67)	13.24	3.47	0.828 (.001)
2	Severity Response efficacy	57.20 (14.12) 48.26 (9.75)	8.94	3.72	0.737 (.001)
3	Counter-rewards Response cost	54.94 (11.65) 43.96 (17.67)	10.98	3.46	0.734 (.001)
4	Counter-rewards Response efficacy	54.94 (11.65) 48.26 (9.75)	6.68	3.00	0.622 (.004)
5	Severity Self-efficacy	57.20 (14.12) 49.76 (12.66)	7.44	3.25	0.555 (.002)
6	Vulnerability Response cost	51.82 (16.55) 43.96 (17.67)	7.86	2.11	0.459 (.040)
7	Counter-rewards Self-efficacy	54.94 (11.65) 49.76 (12.66)	5.18	1.72	0.426 (.092)
8	Self-efficacy Response cost	49.76 (12.66) 43.96 (17.67)	5.80	1.69	0.377 (.097)
9	Severity Vulnerability	57.20 (14.12) 51.82 (16.55)	5.38	1.56	0.350 (.126)
10	Response efficacy Response cost	48.26 (9.75) 43.96 (17.67)	4.30	1.31	0.301 (.197)
11	Vulnerability Response efficacy	51.82 (16.55) 48.26 (9.75)	3.56	1.09	0.262 (.282)
12	Counter-rewards Vulnerability	54.94 (11.65) 51.82 (16.55)	3.12	1.29	0.218 (.203)
13	Severity Counter-rewards	57.20 (14.12) 54.94 (11.65)	2.26	0.72	0.175 (.476)
14	Vulnerability Self-efficacy	51.82 (16.55) 49.76 (12.66)	2.06	0.55	0.140 (.585)
15	Self-efficacy Response efficacy	49.76 (12.66) 48.26 (9.75)	1.50	0.92	0.133 (.362)

Table A4
Sample of random data computed for comparison of mean ranked message effectiveness.

"Message"																																												Mean	SD
1	10	8	1	7	0	15	1	6	6	9	13	5	11	10	8	6	4	15	3	9	9	5	5	12	7	10	11	3	12	7	2	4	11	0	14	4	6	14	11	13	17	6	17	9.19	4.60
2	5	13	16	13	15	5	11	17	1	1	4	8	11	8	7	5	9	2	7	11	1	2	3	13	12	17	15	17	1	7	8	2	0	5	0	6	17	3	3	0	8	5	14	8.51	5.26
3	11	1	15	11	3	13	17	13	3	14	3	12	12	3	6	9	10	5	16	17	6	14	16	1	3	0	7	3	8	13	16	0	17	6	13	3	7	12	15	16	15	13	2	9.20	5.14
4	15	15	0	15	16	8	0	2	1	15	9	8	14	7	3	9	11	15	1	12	1	2	15	4	3	10	1	8	17	4	13	1	10	11	12	6	13	7	2	10	10	4	11	8.40	5.27
5	7	6	7	6	12	11	5	0	15	15	16	12	8	12	15	1	9	14	17	16	13	6	10	15	2	2	12	5	13	15	13	6	13	6	15	3	11	2	4	10	8	2	0	8.69	5.14
6	0	1	15	16	8	13	4	11	10	15	8	0	14	12	7	6	0	13	17	3	4	7	2	3	9	10	4	9	7	5	17	4	8	12	6	12	9	3	5	4	6	16	6	8.89	5.25
7	3	15	16	10	2	16	14	6	16	14	0	6	14	1	7	6	16	4	9	13	6	4	4	16	10	11	9	0	4	14	11	6	12	16	7	10	1	11	12	15	16	17	9	9.21	5.46
8	12	9	1	14	16	6	2	16	15	15	12	14	8	12	6	11	5	4	16	10	13	6	0	14	17	16	1	4	3	13	9	10	7	8	16	12	5	15	4	9	7	16	3	8.93	5.21
9	0	0	6	15	14	10	13	16	10	14	16	13	16	14	4	5	0	12	11	0	9	12	7	7	15	14	1	7	3	3	15	8	8	9	14	11	0	8	16	12	1	8	5	8.74	5.18
10	12	13	3	10	17	16	7	11	7	12	16	9	4	3	10	4	6	5	0	3	5	10	17	16	9	2	7	4	9	4	16	13	13	4	16	4	7	10	14	15	13	16	7	8.16	5.27
11	17	2	13	3	12	13	6	0	11	0	4	9	6	14	12	1	2	0	9	0	10	6	15	16	4	12	6	11	5	7	14	4	15	11	9	14	9	8	6	14	5	10	7	8.49	4.92
12	8	13	12	16	0	16	7	1	3	6	0	1	17	14	1	5	4	3	9	14	10	17	0	3	0	0	4	14	2	4	12	17	5	16	17	13	3	1	14	1	16	8	14	7.78	5.64
13	11	8	13	16	9	0	3	16	16	5	1	0	10	12	4	12	13	4	5	12	4	1	10	14	11	10	15	13	9	12	5	6	5	2	15	1	7	14	17	2	10	12	6	8.02	5.19
14	2	5	8	2	11	3	14	4	13	14	7	6	2	4	14	1	15	6	6	17	5	0	0	9	17	14	3	15	11	11	17	3	6	10	14	10	15	12	17	17	13	3	10	8.78	5.23
15	13	4	9	3	16	5	3	8	17	4	0	2	13	5	3	5	0	15	14	11	15	0	17	5	0	6	10	11	3	15	9	5	1	12	4	1	14	1	16	12	4	3	14	7.70	5.51
16	2	2	11	11	14	5	11	14	2	9	4	7	5	5	5	4	14	8	3	4	3	10	17	16	10	16	0	10	3	5	4	0	12	4	8	8	15	5	13	8	7	10	3	7.58	4.60
17	1	17	12	6	8	0	13	9	14	10	6	2	5	10	6	13	0	5	15	2	1	9	5	4	13	13	17	1	5	7	16	2	6	11	15	4	17	17	15	6	8	8	10	8.57	5.20
18	1	14	3	4	17	6	15	10	10	16	13	0	6	15	14	1	4	12	6	4	9	12	9	1	7	2	17	8	13	9	3	15	14	3	14	6	9	12	8	0	3	17	1	8.51	4.91
																																												8.50	

Table A5
Differences between experimentally derived mean ranks for self-as-driver and for drivers in general, and randomly generated mean ranks.

Variable Rank	*Self-as-driver*	*Random*	*Diff**	*Self SD*	*Random SD*	*Drivers in general*	*Random*	*Diff§*	*Others SD*
1	10.67	9.31	1.36	3.35	4.77	10.09	9.31	0.78	3.16
2	10.15	9.16	0.99	3.43	5.53	10.04	9.16	0.88	3.16
3	10.01	9.05	0.96	3.31	5.30	9.47	9.05	0.42	4.54
4	9.90	8.83	1.07	4.69	4.87	9.41	8.83	0.58	3.61
5	9.51	8.80	0.71	3.41	5.07	9.31	8.80	0.51	3.04
6	9.35	8.77	0.58	3.49	4.93	9.27	8.77	0.50	3.31
7	9.23	8.75	0.48	3.31	5.21	9.25	8.75	0.50	3.02
8	9.00	8.63	0.37	3.35	5.11	9.20	8.63	0.57	3.05
9	8.69	8.59	0.10	3.64	5.49	9.14	8.59	0.55	3.32
10	8.67	8.58	0.09	4.14	4.88	9.02	8.58	0.44	3.67
11	8.64	8.47	0.17	3.37	5.45	8.98	8.47	0.51	3.13
12	8.20	8.42	−0.22	3.01	5.25	8.01	8.42	−0.41	2.97
13	8.16	8.36	−0.20	2.91	5.35	7.95	8.36	−0.41	2.95
14	7.14	8.26	−1.12	3.76	4.98	7.74	8.26	−0.52	3.17
15	6.78	8.16	−1.38	3.34	5.41	6.99	8.16	−1.17	3.58
16	6.68	7.84	−1.16	2.72	5.45	6.62	7.84	−1.22	3.37
17	6.30	7.60	−1.30	3.21	4.94	6.27	7.60	−1.33	2.91
18	5.94	7.46	−1.52	3.33	5.07	6.20	7.46	−1.26	3.48
Mean	**8.50**	**8.50**	**0.00**			**8.50**	**8.50**	**0.00**	
Total	**153.02**	**153.04**				**152.96**	**153.04**		
SE				**3.43**	**5.17**				**3.30**

* Mean difference = 0.75; § Mean difference = 0.70.

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