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Young drivers' responses to antispeeding advertisements: Comparison of self-report and objective measures of persuasive processing and outcomes

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Young drivers' responses to antispeeding advertisements: Comparison of self-report and objective measures of persuasive processing and outcomes

Abstract

OBJECTIVE: Self-report measures are typically used to assess the effectiveness of road safety advertisements. However, psychophysiological measures of persuasive processing (i.e., skin conductance response [SCR]) and objective driving measures of persuasive outcomes (i.e., in-vehicle GPS devices) may provide further insights into the effectiveness of these advertisements. This study aimed to explore the persuasive processing and outcomes of two anti-speeding advertisements by incorporating both self-report and objective measures of speeding behaviour. In addition, this study aimed to compare the findings derived from these different measurement approaches.

METHODS: Young drivers (N = 20, Mage = 21.01 years) viewed either a positive or negative emotion-based anti-speeding television advertisement. Whilst viewing the advertisement, SCR activity was measured to assess ad-evoked arousal responses. The RoadScout→ GPS device was then installed into participants' vehicles for one week to measure on-road speed-related driving behaviour. Self-report measures assessed persuasive processing (emotional and arousal responses) and actual driving behaviour.

RESULTS: There was general correspondence between the self-report measures of arousal and the SCR and between the self-report measure of actual driving behaviour and the objective driving data (as assessed via the GPS devices).

CONCLUSIONS: This study provides insights into how psychophysiological and GPS devices could be used as objective measures in conjunction with self-report measures to further understand the persuasive processes and outcomes of emotion-based anti-speeding advertisements.

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Young drivers' responses to anti-speeding advertisements: Comparison of self-report and objective measures of persuasive processing and outcomes

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ABSTRACT

Objective: Self-report measures are typically used to assess the effectiveness of road safety advertisements. However, psychophysiological measures of persuasive processing (i.e., skin conductance response [SCR]) and objective driving measures of persuasive outcomes (i.e., in-vehicle GPS devices) may provide further insights into the effectiveness of these advertisements. This study aimed to explore the persuasive processing and outcomes of two anti-speeding advertisements by incorporating both self-report and objective measures of speeding behaviour. In addition, this study aimed to compare the findings derived from these different measurement approaches.

Methods: Young drivers ($N = 20$, $Mage = 21.01$ years) viewed either a positive or negative emotion-based anti-speeding television advertisement. Whilst viewing the advertisement, SCR activity was measured to assess ad-evoked arousal responses. The RoadScout® GPS device was then installed into participants' vehicles for one week to measure on-road speed-related driving behaviour. Self-report measures assessed persuasive processing (emotional and arousal responses) and actual driving behaviour.

Results: There was general correspondence between the self-report measures of arousal and the SCR and between the self-report measure of actual driving behaviour and the objective driving data (as assessed via the GPS devices).

Conclusions: This study provides insights into how psychophysiological and GPS devices could be used as objective measures in conjunction with self-report measures to further understand the persuasive processes and outcomes of emotion-based anti-speeding advertisements.

Keywords: Road safety advertising; Emotional appeals; Self-report; Skin conductance response; GPS devices.

INTRODUCTION

Young drivers aged 17 to 25 years constitute a high risk road user group. Overall, they are more likely to engage in risk taking behaviours such as speeding and of being involved in road trauma. Speeding has been reported to increase both the likelihood of a crash occurring and the severity of associated injuries (Liu et al. 2012). Despite evidence that drivers recognise that speeding increases crash risk (Fleiter and Watson 2006), drivers continue to speed. Anti-speeding advertising campaigns represent one long-standing road safety countermeasure, implemented to persuade young drivers to abide by the posted speed limits.

Research examining the effectiveness of road safety advertisements has tended to rely predominantly upon self-report measures of message acceptance (i.e., measures that assess one's reported attitudes, intentions, and/or behaviour) as indicators of the extent to which a message has persuaded. Although previous research has indicated that self-report measures are valid and reliable measures of actual behaviour (e.g., Dillard et al. 2007; Elliott et al. 2003), technological advances have meant that potentially more insights into the persuasive process may be gained by incorporating objective measures of both persuasive processing and persuasive outcomes. For instance, objective measures of individuals' emotional responses, that may be used as an indicator of the extent to which attention is allocated to a message, as well as measures of actual driving behaviour via in-vehicle GPS devices may be used to enhance understanding of persuasive processing and persuasive outcomes, respectively. Given that limited research has compared the findings derived from self-report and objective measures in relation to the persuasiveness of road safety advertising, the current study aimed to address this gap by incorporating objective as well as self-report measures and investigating the correspondence

between results derived from such measures. In addition, acknowledging a growing body of evidence that suggests that the persuasiveness of a road safety message may vary as a function of emotional appeal type; namely, whether an advertisement was a fear- or humour-based message (e.g., Goldenbeld et al. 2008; Lewis et al. 2008), a positive and a negative emotion-based message was included in this study. Therefore, herein, the terms 'positive' and 'negative' are used to denote the emotional appeal or message type.

Psychophysiological measures of persuasive processing

Psychophysiological measures, such as skin conductance, are designed to measure moment-by-moment arousal responses towards emotional stimuli. Skin conductance response (SCR) measures activity from sweat glands and are assumed to reflect both positive and negative emotional arousal (Boucsein 2012). However, previous research has reported that fear-evoking stimuli produce greater SCR than positive/ nurturance stimuli (e.g., Lang et al. 1993). With the exception of Algie and Rossiter (2004), limited research has applied SCR to examine emotional responses towards road safety advertisements. Algie and Rossiter (2004) measured participants' SCR activity (as a measure of persuasive processing) to one of eight fear-only advertisements (i.e., in the fear-only condition, the content of the messages was designed such that participants felt no reduction in fear at the end of the advertisement) or fear-relief advertisements (i.e., in the fear-relief condition, the content of the message was designed so that participants felt a reduction of fear at the end of the advertisement). The findings revealed a trend in that participants showed slightly higher SCR scores on presentation of the fear-relief advertisements compared to the fear-only advertisements.

Although such psychophysiological measures are relatively uncommon in research within the road safety advertising context, in the health communication context more broadly, a number of studies have applied SCR to assess psychophysiological responses and, in doing so, have highlighted the value of using such objective measures to assess automatic arousal (e.g., Lee and Lang 2009; Ordoñana et al. 2009; Strasser et al. 2009; Xu 2014). Lee and Lang (2009), for instance, examined SCRs to the emotional content of fear, anger, joy, and sadness, while participants were viewing a range of television messages. The SCR findings revealed that, compared to neutral advertisements, advertisements which included fear, anger, and joy elicited increased SCR activity. Further, self-reported ratings of subjective arousal were consistent with the objective SCR findings (i.e., higher arousal self-ratings which corresponded with the detected increases in SCR activity). Similarly, Ordoñana et al. (2009) found that participants rated greater fear and showed increased SCR activity towards high threat-based tetanus vaccination messages compared with the low threat-based message. Collectively, these studies reveal consensus between the self-report and objective measures of arousal and highlight that advertisements that contain emotional stimuli may generate greater automatic arousal responses. However, these findings may differ depending on the type of behaviour under investigation (e.g., preventative health behaviour such as vaccinations vs. reducing risky behaviours such as speeding behaviour). Given that limited research has compared self-report and objective measures of arousal (as operationalisations of message processing) in a road safety advertising context, the current study applied both approaches to assess arousal responses towards a negative and a positive emotion-based road safety advertisement.

Based on the aforementioned research, the following hypotheses were proposed:

H.1. It was predicted that the negative message would elicit stronger self-reported negative emotions than the positive message which, in turn, would elicit stronger positive emotions than the negative message.

H.2a. Given that fear-evoking stimuli may be associated with greater arousal than positive stimuli (e.g., Lang et al., 1993), it was anticipated that the negative message would be associated with higher self-reported ratings of arousal than the positive message.

H.2b. It was predicted that the negative message would elicit greater automatic arousal (assessed via SCR) than the positive message.

Objective driving measures of persuasive outcomes

Increasingly within the traffic psychology literature, studies are comparing on-road behavioural data obtained from GPS devices with self-reports of one's driving-related behaviour/s (e.g., Albert et al. 2014; Blanchard et al. 2010; Molnar et al. 2013; Huebner et al. 2006; Marshall et al. 2007). Blanchard et al. (2010), for example, reported that GPS devices provided a more reliable measure of the number of driving trips and stops compared with participants' self-reports. Similarly, Huebner et al. (2006) found discrepancies between older drivers' self-reported distance travelled with data extracted from an in-vehicle "CarChip". A more recent study examining driving behaviour of young adults found similar discrepancies in self-reports and in-vehicle GPS data with the latter revealing drivers had engaged in more risky behaviours than their self-reports had suggested (Albert et al. 2014).

The current study therefore sought to extend upon previous research by comparing a self-report measure of message acceptance (i.e., extent of self-reported adherence to the speed limit) with an objective behavioural measure of message effectiveness (i.e., proportion of time spent

driving over the speed limit as obtained via an in-vehicle GPS). The latter measure was based upon actual on-road behaviour for a one week period following exposure to an anti-speeding message. One exploratory hypothesis was proposed:

H.3. Given that previous research has revealed some inconsistencies between self-report and objective driving measures, it was expected that scores derived from such self-report and objective measures would show a positive, but weak association.

METHOD

Participants

Young drivers ($N = 25$) aged between 17 to 25 years with a valid Australian driver's licence were recruited via email and the University's online recruitment system for undergraduate students. Participants were also required to drive at least 1-2 hours per week and have had access to a vehicle which was manufactured from the year 2006 onwards to be compatible with the GPS device. Five participants were excluded due to technical problems with the GPS or SCR devices ($n = 4$) and one participant did not drive after the GPS device was installed into their vehicle, leaving a final sample of 20 participants ($M_{age} = 21.01$, $SD = 2.42$; age range: 17.06 to 25.02), 15 females. Ten participants held an open/ unrestricted licence, seven participants a provisional 2/ restricted licence, and three participants reported holding a provisional 1/ restricted licence. A provisional 1 driver's licence is received upon passing a driving test; provisional 2 driver's licence is received after holding a provisional 1 licence for one year. The majority of participants ($n = 16$) were undergraduate university students who received partial course credit for their participation. All other participants received an AUS\$50 gift card (see Supplement for further information on the current sample).

Design

A between-groups design was employed whereby participants were randomly allocated to view either the positive or negative anti-speeding message. Random allocation was achieved by generating random numbers with Excel's RANBETWEEN function. Viewing only one message type prevented a potential confound whereby, if exposed to more than one message, it has been suggested that individuals would have likely scored the effectiveness of each advertisement in accordance with relative judgements they would have been making across different advertisements they had been exposed to (see Elliott 1987).

Materials

Road safety advertisements: Two anti-speeding television advertisements, one a negative and the other a positive emotion-based approach, were approved for use from road safety authorities in Australia and New Zealand. The negative advertisement (from New Zealand) incorporated a physical threat whereby a car crash (i.e., a negative outcome) was depicted as the consequence of a driver engaging in speeding. In contrast, the positive advertisement (from the state of Western Australia) highlighted the positive outcome of "enjoying the ride" as being associated with a driver depicted as having complied with the speed limit (see Table 1 for a description of each emotional appeal). Both advertisements were 60 seconds in length and all participants self-reported that they had not previously viewed the advertisement (which was as anticipated/ desired given that these advertisements were intentionally chosen from locations elsewhere to the state of Australia in which the study was being conducted, Queensland). The majority of social psychological-based studies of persuasion, particularly those in a road safety context, typically use one-off or a limited number of exposures

to a message and their assessment of the persuasive effects (e.g., Kaye et al. 2013; Tay et al. 2001). While this approach heightens internal validity, it is acknowledged however, that this approach comes at a cost to external validity/ ecological validity of the study. There has been much discussion in the literature regarding the number of advertisement exposures which should be included to induce behaviour change (see Wundersitz et al. 2010). The more contemporary views as espoused by researchers such as Donovan et al. (1999) is that it is time to move on from the debate as to whether advertising works to the key question, "which type of advertising message is the most effective/ persuasive". Taking on board the above points, this study attempted to bring more objective measures to such outcomes as on-road behaviour.

Insert Table 1 about here

Objective measures of persuasive processing and outcomes:

Psychophysiological response. The 2701-SC Simple Scope device was employed to measure SCR with a sample rate of 10 Hz. This skin conductance software is designed to assess moment-by-moment changes in individuals' arousal levels while viewing a stimulus (the advertisement). Skin conductance was recorded for two minutes prior to showing the advertisement, with the middle one minute used to calculate the average baseline. Difference scores (i.e., average baseline recording subtracted from the SCR recordings; Thornton 2005) were computed to assess participants' arousal levels towards the advertisement. Wesley's 4-step analysis was then used to compute each participant's SCR score to include in later SPSS analyses (see: Hopkins and Fletcher 1994 for further information on the step analysis). The

average SCL graphs for the negative and positive message conditions are provided in the online Supplement.

Actual driving behaviour. The RoadScout® S4 GPS device was installed into participants' vehicles to monitor actual driving behaviour for one week after viewing the anti-speeding advertisement. The RoadScout® S4 GPS device was connected to the vehicle's OBD port, with the external GPS/ GSM antenna attached on or under the front dashboard of the vehicle. Data extracted from the RoadScout® S4 GPS device for this study consisted of total driving duration, total driving distance, and speeding behaviour (i.e., total time spent driving over the posted speed limit across seven speed zones; increments of 10km/h from 50km/h to 110km/h; Newnam et al. 2014). The total proportion of time spent driving over the posted speed limit was used as the measure of participants' speeding behaviour. Participants were also provided with a self-report driving diary to record driving dates and trip start/finish times so as to enable the researchers to identify and exclude any driving data from other drivers (e.g., friends and family of the participant) who drove the vehicle while the GPS was installed.

Self-report measures of persuasive processing and outcomes: To measure self-reported persuasive processing, self-report measures of emotional responses and arousal were assessed. For self-reported persuasive outcome, one item was used to assess actual behaviour change.

Emotional responses. Participants were asked to rate the extent to which they had experienced specific emotions towards the advertisement on a 4-point Likert Scale of [1] *Definitely did not feel like this at all*, [2] *Possibly felt this*, [3] *Felt this somewhat*, and [4] *Definitely did feel this*. Emotional responses consisted of sad, fearful, anxious, relaxed,

competent, happy, proud, excited, amused, agitated, and relieved. These items were adapted from the Positive and Negative Affect Schedule (PANAS; Crawford & Henry, 2004) and informed by Witte (1999) with measure of fear.

Arousal. Arousal was assessed by two items that were previously used by Bradley and Lang (1994). A 7-point semantic differential scale using two word pairs: *unaroused/ aroused* and *relaxed/ stimulated* ($r = .342, p = .140$) assessed participants' subjective arousal ratings towards the advertisement.

Actual behaviour change. Using a 5-point Likert Scale (1 = *Never*, 5 = *Very often*), one item assessed self-reported actual behaviour, "In the last week, did you stay within the speed limit in any given speed zone". This item was similar to a measure used elsewhere (e.g., Lewis et al. 2010).

Procedure

Participants were required to take part in two, in-person testing sessions, one-week apart. At time 1, participants provided written informed consent and completed the first section of the online questionnaire (demographic items). Participants were then fitted with two cuffs on their index and middle fingers which recorded their SCR while watching an advertisement. Participants were instructed to direct their attention towards a fixation cross that was presented in the centre of a laptop screen (14.1 in. screen size; 1200 x 800 screen resolution) for 2 minutes, prior to viewing the road safety advertisement. The finger cuffs were then removed and participants completed the second section of the online questionnaire (including measures not reported here). The GPS device was then installed into the participant's vehicle and, at this time, the participants were provided with the driving diary. At time 2, participants completed a brief

pen and paper copy of the follow-up self-report questionnaire (measuring actual driving behaviour and exposure to road safety advertisements since time 1). The GPS device was then removed from the participant's vehicle and the completed driving diary collected.

Analysis

A series of independent groups *t*-tests examined the extent to which emotion (H.1) and arousal (H.2a, H.2b) influenced responses towards the negative and positive road safety advertisements. To compare self-report and actual driving behaviour (assessed via the GPS devices; H.3), point bi-series correlations were undertaken to assess the associations between participants' self-reported ratings of staying within the speed limit (categorical variable) and the total proportion of time spent driving over the posted speed limit (continuous variable). All significant values were assessed at $p < .05$, unless otherwise stated. Manipulation checks are initially presented, followed by the main analyses.

RESULTS

Manipulation and preliminary checks

Manipulation checks revealed that the positive and negative anti-speeding advertisements were functioning as intended (i.e., participants detected the true positive and negative focus of the respective advertisements; the positive advertisements were perceived to include positive cues and the negative advertisements were perceived to include negative cues). The manipulation checks also revealed that participants attended to the main message presented in the advertisement. There were no significant differences in demographic data (age, gender, licence status, and education), the total number of driving days or total weekly driving time between

participants who viewed the negative and positive advertisements that could have potentially confounded findings (see Supplement for further details).

H.1. Ad-evoked emotional responses

Self-report measures of emotion by advertisement condition: For these analyses, a critical value of $p \leq .01$ was applied to control for multiple comparisons. The results showed that, as anticipated, the participants who viewed the negative advertisement rated feeling significantly more fearful and anxious compared to those that viewed the positive advertisement (see Table 2). In contrast, individuals who viewed the positive advertisement rated feeling significantly happier, more relaxed, competent, relieved, and proud than those individuals who viewed the negative advertisement (see Table 2), consistent with H.1. Although failing to reach the critical cut-off value for statistical significance ($p \leq .01$), the findings revealed that the emotion of amused was tending towards significance ($p < .05$) and in the expected direction (see Table 2).

Insert Table 2 about here

H.2. Ad-evoked arousal responses

H.2a. Self-report measures of arousal by advertisement condition: Consistent with H.2a, the negative advertisement was significantly more likely to make participants feel stimulated ($M = 4.55$, $SD = 1.21$) compared to participants who viewed the positive advertisement who rated feeling more relaxed ($M = 3.11$, $SD = 1.05$), $t(18) = 2.79$, $p = .012$, 95% CI [0.35, 2.52], $d = 1.27$. There was, however, no significant difference in self-reported arousal

between the negative ($M = 4.00$, $SD = 1.34$) and positive ($M = 3.67$, $SD = 1.41$) advertisement conditions, $p = .596$, which was inconsistent with predictions.

H.2b. Psychophysiological responses of arousal by advertisement condition: There was no significant difference in SCR scores between participants who viewed the negative ($M = 0.48$, $SD = 0.21$) or positive advertisements ($M = 0.33$, $SD = 0.28$), $t(18) = 1.30$, $p = .210$, 95% CI [-0.09, 0.37]. This finding is inconsistent with H.2b. Although failing to reach significance, inspection of the mean scores revealed slightly higher SCR scores for participants who viewed the negative advertisement compared to participants who viewed the positive advertisement, with a medium effect size ($d = 0.61$).

H.3. Driving behaviour as a measure of persuasive outcomes

Comparison of self-report and objective measures of driving by advertisement condition: For participants who viewed the negative advertisement, there was a significant, large negative correlation between the self-report ($M = 3.55$, $SD = 0.52$) and objective driving data ($M = 8.68$, $SD = 6.96$), $r = -.772$, $p = .005$, indicating that participants who self-reported higher ratings of staying within the speed limit spent less time driving over the posted speed limit. For participants who viewed the positive advertisement, there was a moderate negative relationship between the self-report ($M = 3.78$, $SD = 0.44$) and objective driving data ($M = 4.59$, $SD = 3.39$), $r = -.522$, $p = .150$, which failed to reach significance.

To further examine if the self-reported and objective measures of driving behaviour differed as a function of advertisement condition (positive versus negative), Fisher's z transformation was conducted on the above-mentioned correlation coefficients. The finding revealed that the correlation between the self-report and objective measures of driving was

similar for both the negative and positive advertisement conditions, $z_{\text{obt}} = 0.62$, $q = -0.33$, and was associated with a medium effect size (Cohen 1988). These findings highlight that irrespective of the advertisement type, participants showed concordance between their self-reported compliance with the speed limit and their objective speeding behaviour as assessed by the GPS devices.

DISCUSSION

This study aimed to explore the extent to which there was correspondence between self-report and objective measures (SCR and GPS device) of persuasive processing and outcomes. These measures were explored in regards to both a negative and a positive anti-speeding advertisement. Overall, the findings revealed that there was general concordance between the self-report and objective measures of arousal (with arousal assessed as a measure of persuasive processing) and between the self-report and objective measure of driving behaviour.

Ad-evoked emotional responses (H.1)

Consistent with H.1, participants who viewed the negative advertisement rated feeling more fearful and anxious compared to those participants who viewed the positive advertisement who, in turn, rated feeling happier and more relaxed, competent, relieved, and proud in response to the latter advertisement.

Ad-evoked arousal responses (H.2)

The results provided only partial support for H.2a, which predicted that the negative advertisement would lead to higher self-reported arousal ratings than the positive advertisement. Consistent with this prediction, participants reported feeling more stimulated after viewing the negative advertisement and more relaxed after viewing the positive advertisement. However,

there were no differences in self-reported arousal ratings or SCR activity between the two advertisement conditions, inconsistent with H.2b. However, it is possible that the current study was under powered to detect any effects and as such, future research would be of value to further explore these with a larger sample size.

Overall, the current findings showed general concordance between the self-report and objective measure of arousal, with such arousal assessed as a measure of persuasive processing. These findings are consistent with previous research that has used the two measurement approaches to examine ad-evoked arousal responses towards emotion-based television public services announcements (Lee and Lang 2009) and video-based tetanus vaccination messages (Ordoñana et al. 2009). Further, although the item pair of relaxed-stimulated in the self-report arousal scale has been suggested by some to be a dimension of arousal (see Bradley and Lang 1994), the current findings suggest that the dimension of aroused-unaroused may be more compatible with SCR activity. Given the lack of research that has incorporated psychophysiological measures to examine responses towards road safety advertisements, future research is required with a larger sample to further evaluate the extent to which there is correspondence between such self-report and objective measures of arousal, and in particular, with respect to positive versus negative emotive types of such advertisements.

Objective and self-report driving measures of persuasive outcomes (H.3)

The current study extended upon previous research in that as well as self-report measures of message acceptance (of which self-reported behaviour may be assessed), objective data on behaviour was also obtained from an in-vehicle GPS device, which assessed participants' level of speeding (or compliance) in the week following exposure to one of the advertisements. The

results revealed that for the negative advertisement condition, participants who reported higher ratings of staying within the speed limit had spent less time driving over the posted speed limit. Similar results were found for the positive condition, although the results did not reach significance. These findings suggest that there is correspondence between self-report and objective on-road measures of young drivers' speeds, which was not consistent with predictions.

Strengths, limitations, and future research

This study represents one of the first to compare self-report and objective measures of persuasive processing and persuasive outcomes in regards to assessing the effectiveness of road safety advertising. The findings revealed some correspondence between measures of self-reported arousal and ad-evoked SCR as an objective measure of arousal (i.e., measures of persuasive processing) and between measures of self-reported driving behaviour and the in-vehicle GPS data (i.e., measures of persuasive outcomes). Given the relatively small sample on which these results are based, replication of this study's findings will be important to further examine the results derived from different methodological approaches. This study has taken the first steps towards demonstrating the feasibility of combining self-reports and objective measures to further understand the persuasive process and outcomes.

The main limitations of the current research relates to the relatively small sample size and lack of a control group. It is important to note, however, that this sample size is consistent with previous research that has compared behavioural data obtained from in-vehicle devices with self-report measures of behaviour (e.g., Huebner et al. 2006 and Marshall et al. 2007; both comprised a sample of 20 participants). Nonetheless, future research which comprises a larger sample and a control condition would be advantageous in further examining the degree of correspondence

between self-report and objective measures and remove queries as to whether effects found (or more appropriately, effects not observed) reflect a true finding or a lack of statistical power.

Potentially, future research would also benefit from recording objective data both pre and post advertisement exposure to enable an evaluation of behaviour change over time.

In the current study, the advertisements were both 60 seconds in length and both focused on speeding behaviour. However, one disadvantage of using real television advertisements is the possibility that factors other than emotional valence (e.g., number of screen shots, actors, and additional contextual differences) may also influence individuals' perceptions towards the advertisements. Although the current study was unable to control for all of the potential confounds relating to the advertisements' respective content, the choice to use existing television advertisements is advantageous to the extent it increases ecological validity.

Although the current study included both self-report and objective measures of arousal (as a persuasive processing measure) and driving behaviour (as a persuasive outcome measure), future research in the road safety advertising context would likely benefit from expanding the types of objective processing measures investigated. For example, measures of electrocardiography (ECG; heart-rate) and/or facial electromyography (EMG) could be used to further assess affective physiological responses towards road safety messages. Specifically, ECG has been associated with positive and negative emotional processing (Palomba et al. 1997), while facial EMG can discriminate between a range of specific emotions (e.g., anger, disgust, happiness, surprise; Lundqvist 1995). Incorporating a range of objective physiological measures to further assess effects of road safety advertisements may enable researchers to identify specific emotional responses that are elicited on presentation of positive and negative-based messages

which, in turn, would contribute greater specificity in the study of emotion-based persuasion. In particular, the approach would potentially enable a more reliable means, than self-reports, to determine the nature of emotions elicited in response to advertisement exposure and subsequently the extent to which such emotions contributed to persuasive outcomes could be investigated.

In conclusion, this study offers evidence regarding the extent to which self-report and objective measures may be applied to assist in understanding more about the persuasive process as well as associated outcomes in regards to different types of emotion-based road safety advertising messages. Research efforts to enhance understanding of the effects of different types of advertising messages are crucial to the extent that, in road safety, such advertisements are intended to play an important role in persuading road users to adopt safer and legal behaviours on the road.

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Table 1

Brief Description of the Negative and Positive Emotional Appeals

Emotional Appeal	Brief Description
<p>Negative advertisement (-Landminesø New Zealand)</p>	<p>A male driver is driving down a winding road. After 13 seconds, landmines arise from the road. The voice over highlights that when you speed you increase the chance of crashing. At 45 seconds the driver loses control of the vehicle around a corner. The vehicle travels off an embankment and is flipped onto the roof.</p>
<p>Positive advertisement (-Slow down an enjoy the rideø Australia)</p>	<p>The advertisement opens with a man running down a street. The voice over highlights that life is not a race. The next 15 seconds of the advertisement highlights the benefits of slowing down and enjoying life. At 30 seconds, two vehicles are shown, one of which is speeding and the other of which is complying with the posted speed limit. While the speeding vehicle reaches the red traffic light first, both vehicles are required to stop. This section of the advertisement highlights that there are no time benefits of speeding. The advertisement ends with the voice over stating, "driving can be a pleasure if we donø treat it like a race, so slow down and enjoy the rideö.</p>

Table 2

Independent Groups t-tests of Emotions for the Negative (n = 11) and Positive (n = 9)

Advertisement Conditions

Emotions	<i>M (SD)</i>	<i>t</i>	<i>p</i>	95% CI	<i>d</i>
Sad					
Negative	2.45 (0.82)				
Positive	1.67 (0.87)	2.09	.052	-0.01, 1.58	0.92
Fearful					
Negative	2.91 (0.54)				
Positive	1.22 (0.44)	7.54	< .001	1.22, 2.16	3.43
Anxious					
Negative	2.82 (0.75)				
Positive	1.44 (0.73)	4.13	.001	0.68, 2.07	1.86
Relaxed					
Negative	1.27 (0.47)				
Positive	3.56 (0.53)	-10.27	< .001	-2.75, -1.82	-4.57
Competent					
Negative	1.82 (0.75)				
Positive	3.00 (1.00)	-3.02	.007	-2.00, -0.36	-1.34
Happy					
Negative	1.18 (0.60)				
Positive	3.11 (1.05)	-5.15	< .001	-2.72, -1.14	-2.26
Proud					
Negative	1.09 (0.30)				
Positive	2.33 (1.12)	-3.24*	.010	-2.11, -0.37	-0.84
Excited					
Negative	1.09 (0.30)				
Positive	1.56 (0.73)	-1.80*	.102	-1.04, 0.11	-1.51
Amused					
Negative	1.18 (0.60)				
Positive	2.11 (1.17)	-2.30	.034	-.178, -0.08	-1.00
Agitated					
Negative	1.45 (0.52)				
Positive	1.11 (0.33)	1.78*	.092	-0.06, 0.75	0.78
Relieved					
Negative	1.09 (0.30)				
Positive	2.33 (0.87)	-4.12	.002	-1.92, -0.56	-1.91

Note. Scale (1 = *Definitely did not feel like this at all*, 4 = *Definitely did feel this*); *Homogeneity of variance breached and therefore, equal variances not assumed statistic is reported.