

REVERSING THE CYCLE OF DISTRACTION: A SOCIAL AWARENESS CAMPAIGN STUDY

2024-2025

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Summary



The aim of Survey 1 was to investigate four types of driving distraction (behavioural/physical/manual, cognitive, visual and auditory) in relation to the demographics of Australian Capital Territory (ACT) drivers. To achieve this aim, the study used an online survey to ask participants a series of questions on their demographic details, driving distractions and other related factors, such as self-regulation, spatial distance, temporal distance and optimism bias (see p. 5 for operational definitions). Survey 1 received responses from 476 participants across age groups and with a nearly balanced gender ratio.

The study's findings suggested that ACT driver participants were distracted by behavioral/physical (29.4%) and auditory (28.2%) distractions. These distractions may contribute to the driver's miscalculation of spatial and temporal distances between the driver's own vehicle and other vehicles or objects. This means that distracted drivers cannot refocus on road conditions with a correct calculation of the time distance (i.e., applying the 3-second rule) and spatial distance (i.e., the physical distance between the driver's own vehicle and other vehicles or objects on the road).

Findings from an eye-tracking study (120 participants) reinforced the importance of gender differences in visual attention and the role of emotionally compelling content in message retention. Female participants exhibited more eye fixations than male participants, suggesting their higher visual engagement with the advertisements.

While multi-actor advertisements received greater attention than single-actor advertisements, female participants tended to show more facial fixations than male participants. Awareness messages in advertisements were more likely to be noticed and retained by participants with higher eye fixation rates, highlighting the importance of clear and prominent message placement. The study also supported the preference for featuring male drivers in advertisements, with participants demonstrating higher levels of attention when male drivers were featured.

With 103 participants from the eye-tracking study, a driving simulator study further explored the effects of distraction in a controlled lab environment. Results indicated that participants were most affected by behavioral/physical and auditory distractions, while cognitive (i.e., verbal) and visual distractions had the least impact on driving performance. This result aligns with the findings from Survey 1, indicating that drivers are more affected by behavioral and auditory distractions. Contrary to expectations, drivers' self-perceived vulnerability to distractions did not significantly affect their attentional capacity while driving. This may be due to drivers' limited awareness of their own susceptibility to distractions, suggesting that self-assessments may not accurately reflect actual driving behaviour. These findings emphasise that objective assessments are needed to better understand the influence of in-vehicle distractions and individual vulnerability on driving performance.

Survey 2 aimed to assess the effectiveness of road safety advertising messages in motivating ACT drivers to adopt messages conveyed in these advertisements. A total of 320 ACT drivers participated in the survey. The demographic analysis of the sample indicated that most drivers (64.3%) were over 55 years old, while 54.1% of participants were male.

Regarding in-vehicle distractions, participants self reported being primarily distracted by cognitive (31.3%) and auditory (27.7%) factors, followed by behavioral (26.9%) distractions, with visual (17.2%) distractions having the least impact. When asked about their preference for the type of distraction depicted in road safety messages, behavioural (41.9%) and visual (17%) distractions were the most preferred, while auditory(12.5%) and cognitive (11.9%) distractions were the least preferred. While the latter result does not exactly match the self-reported

findings, as a point of comparison, it highlights the vulnerability of ACT drivers to behavioral distraction and their preference for addressing such distractions in ACT road safety initiatives. This finding also aligns with Survey 1 and the driving simulator results, which showed that drivers were most vulnerable to behavioral distractions in simulated driving situations and reported behavioral distraction as one of the most frequent distractions in the car.

The results confirmed that ACT driver participants preferred to see male drivers instead of female drivers in road safety advertisements. Interestingly, the “no driver” option was preferred to seeing a female driver in road safety advertisements. While most ACT driver participants usually drove alone, they favoured advertisements that depicted a family in the car, followed by scenarios featuring children as passengers. This preference for family-oriented portrayals suggested that ACT driver participants engaged more with messages that emphasised collective responsibility and the potential impact of driving behaviour on loved ones.

In terms of the preferred type of messages in advertisements, ACT driver participants favoured emotional and behavioural messages over those focused on social interaction or cognitive aspects. Additionally, they reported that road safety messages evoking emotional messages, particularly those evoking negative emotions like fear or guilt, were found to be more effective in capturing attention and reinforcing road safety awareness. This finding highlighted the effectiveness of emotionally charged content in reinforcing safe driving habits. From a media perspective, road safety advertisements that combined pictorial and audio elements were the most preferred, followed by those incorporating pictorial and text-based formats. This suggested that multi-sensory messaging was more effective in capturing attention and conveying safety messages.

When considering temporal framing, ACT driver participants found that messages emphasising immediate loss were the most effective, followed by those highlighting future loss. This preference indicated that drivers were more responsive to warnings of immediate consequences rather than long-term risks.

Finally, from a cognitive load perspective, clear and simple messages were deemed the most effective in road safety advertisements. This underscored the importance of straightforward and easily digestible content in ensuring message retention and behavioural impact.

After each study in this report, a list of recommendations is provided and, at the end of this report, recommendations for future social awareness campaigns are also listed. The summary of findings from Survey 1, Eye Tracking, Driving Simulator, and Survey 2 is presented in the table below.

Studies	Survey 1	Eye- tracking	Driving Simulator	Survey 2
Number of Participants	N= 476	N= 120	N= 103	N= 320
Findings	ACT driver participants were mostly distracted by behavioral/ (29.4%) and auditory (28.2%) distractions, followed by cognitive (24.8%) and visual (17.60%) distractions	Messages in advertisements were more likely to be noticed and retained by female participants than male participants, due to their higher eye fixations (33.48±8.51 fixations per ad video) and greater visual engagement with the advertisements. Additionally, male drivers in ads attracted greater visual attention and received a significantly higher percentage of facial fixations (19.91±23.65) than female drivers in ads (13.83±14.14).	52.42% of participants reported being most vulnerable to cognitive and auditory distractions, while 47.57% indicated vulnerability to visual and behavioral/physical distractions. In the driving simulator test, participants were most affected by behavioral distractions, followed by auditory distractions. Cognitive distractions had a slightly lower impact than auditory distractions, while visual distractions had the least impact on driving performance.	Participants self-reported being primarily distracted by cognitive (31.3%) and auditory (27.7%) factors, followed by behavioral (26.9%) distractions, with visual (17.2%) distractions having the least impact. However, when asked about their preference for the type of distraction depicted in road safety messages, behavioral (41.9%) and visual (17%) distractions were the most preferred, while auditory (12.5%) and cognitive (11.9%) distractions were the least preferred.

Operational definitions

Cognitive distraction

Distraction of a driver inside his/her own vehicle, related to deep thinking, anxiety about present or future events, past trauma, etc.

Visual distraction

Distraction of a driver inside his/her own vehicle, related to visual activities, such as looking behind at his/her baby, or looking at mobile phone, Navigator app., etc.

Behavioural/physical distraction

Distraction of a driver inside his/her own vehicle, related to activities, such as eating, adjusting vehicle's mirrors, using a mobile phone to text, etc.

Auditory distraction

Distraction of a driver inside his/her own vehicle, related to auditory activities, such as listening to loud music or the radio, a crying baby, passengers' conversation, etc.

Physical/spatial distance

The physical/spatial distance calculated by a driver between his/her own vehicle and other objects and vehicles on the road.

Temporal distance

The time distance (i.e., the 3-second rule) calculated by a driver between his/her own vehicle and the vehicle in front of him/her.

Optimism bias

With optimism bias, a driver believes unrealistically that if accidents happen, he/she and his/her vehicle will not be affected. This belief is that accidents will always happen to other drivers and other vehicles.

Self-regulation

A driver's strong belief that he/she never gets distracted and can resist the temptation when driving if faced with any distraction, including avoiding the temptation of chasing other vehicles. The driver believes that he/she does not

break speeding laws or become involved in competition with other drivers and their vehicles, either through distraction or temptation.

Perceived behavioural control (PBC)

A driver's confidence about his/her ability to control any situation even if risky driving is involved. The driver's perception of his/her higher level of behavioural control induces him/her to become involved in risky driving (e.g., speeding, dangerous lane changing, etc.) as he/she believes in his/her ability to manage the situation.

Risk-taking attitude

A driver's attitude towards taking risks while driving. He/she may believe it is fun, satisfying, enjoyable and a good idea to take risks to overcome a boring and/or monotonous driving pattern.

Ad-self-congruency

This term means that the audience can connect to advertising content and messages or to characters like themselves. For instance, a mother with a school-going child prefers an advertisement in which the driver is a mother with a school-going child.

Cognitive load

This term means the mental effort that an individual needs to contribute to process and understand the information provided in an advertisement.

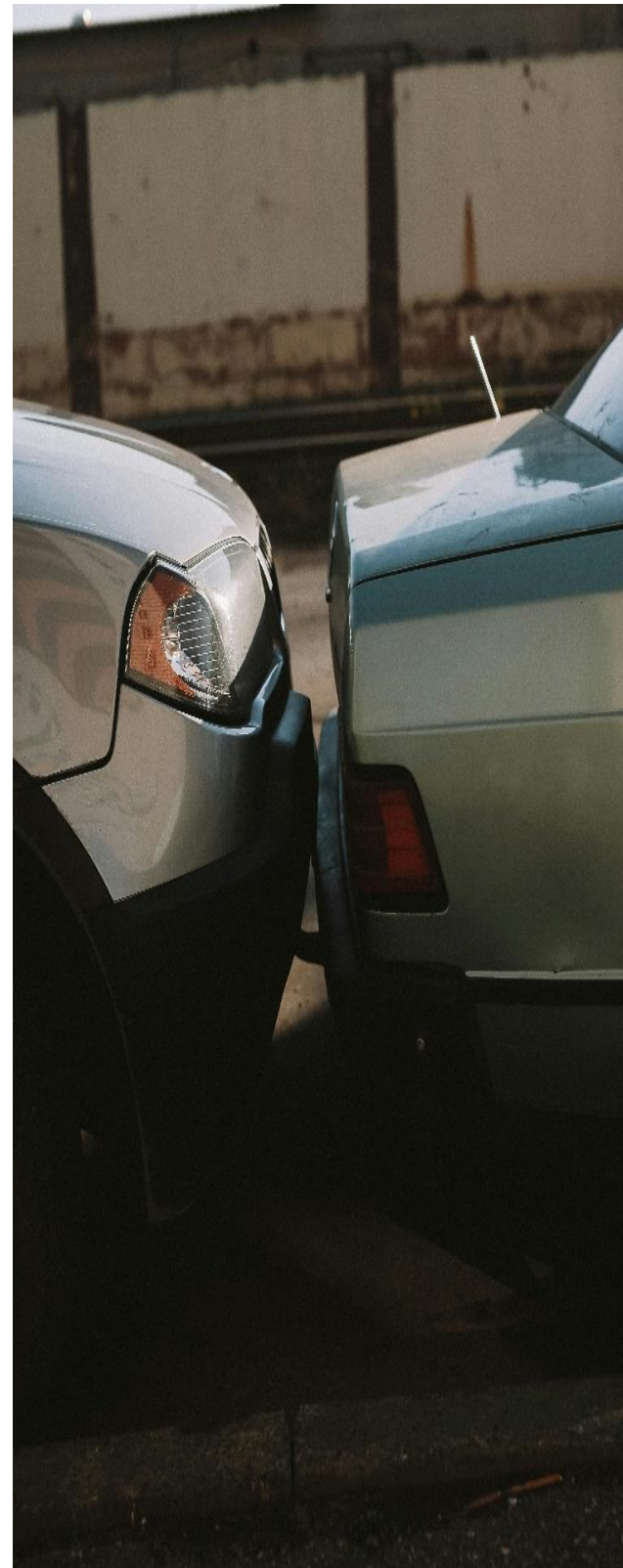
“There are always distractions, if you allow them”.

- Tony La Russa

former US professional baseball player, coach and manager

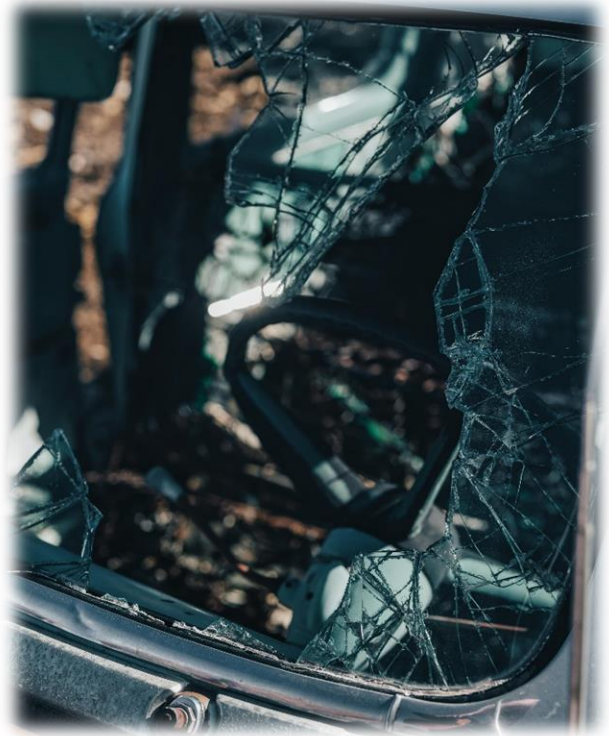
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Introduction

In-vehicle distractions are one of the key causes of road crashes and a threat to road safety (Yan et al., 2022). Distracted driving means the driver is doing something else (a secondary task) and not focusing on the primary task, namely, driving (Amini et al., 2023). It was estimated in 2022 that around 16% of major road crashes in Australia happened due to distracted driving (Australian Automobile Association, 2022). At any point of time, it is assumed that around 3% to 4% of drivers would be distracted on the road, with these drivers having three times more chance of involvement in a crash (Karl et al., 2022). While the Australian government allocates millions of dollars to road safety campaigns (Road Safety Program, 2024), these campaigns only reduce road crashes by an average of around 9% (MacDonald, 2024). One of the reasons is that road safety campaigns/advertisements are unique in their nature as, unlike those that promote commercial products and services, they need to target road users with educational or instructional components (Castillo-Manzano et al., 2012).



This report, therefore, aims to investigate the in-vehicle causes of driver distraction in the context of the Australian Capital Territory (ACT) and to provide a set of recommendations based on the findings. To achieve these aims, the report includes the results of two separate surveys, an eye-tracking study and a driving simulator-based study. The following sections provide details of the process, findings and recommendations.

Report on Survey 1

Aim

In Survey 1, the study aimed to gain an understanding of the demographic profile of Australian Capital Territory (ACT) drivers and to examine the impact of each type of distraction (visual, auditory, cognitive and behavioural/physical) on drivers' calculations of spatial and temporal distances.



Other questions related to participants' driving, such as optimism bias, self-regulation, risk-taking attitude, etc. Finally, IBM SPSS Statistics, a widely used quantitative data analysis tool, was used to analyse the data.

Method

An online survey, with 509 ACT driver participants, was conducted in early 2024. The questionnaire asked a range of questions on drivers' demographic profiles (e.g., age, gender and other factors). Other questions related to participants' driving, such as optimism bias, self-regulation, risk-taking attitude, etc. Finally, IBM SPSS Statistics, a widely used quantitative data analysis tool, was used to analyse the data.

Key findings

In Survey 1, most participants (around 89%) were aged above 40 years. This was consistent with the ACT's general population breakdown, with 60% of the total population being aged above 44 years <abs.gov.au>.

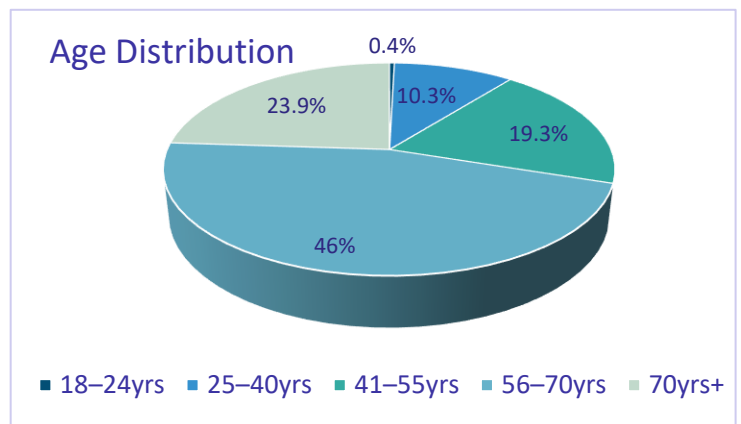


Figure 1: Age distribution

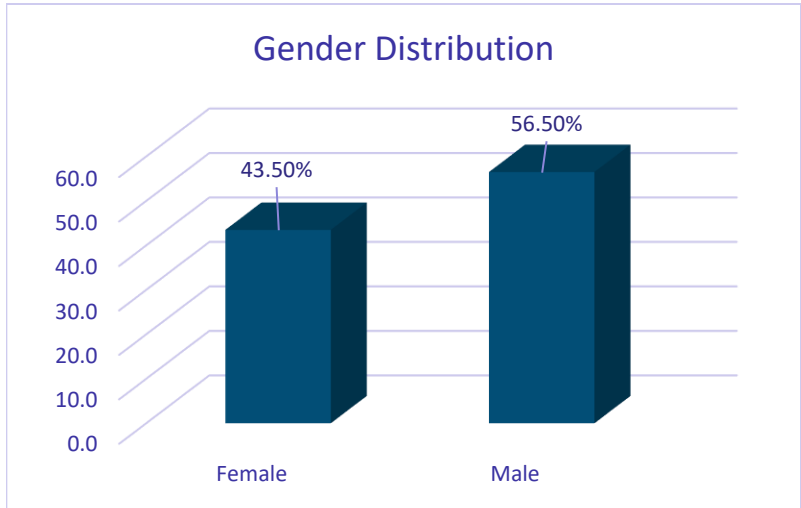


Figure 2: Gender distribution

In terms of gender, Survey 1 participants comprised a nearly balanced ratio of male drivers (around 56.50%) and female drivers (around 43.50%).

When asked about their most frequent location for driving, most ACT driver participants (around 60%) reported that they drove only in urban areas. A mix of urban and rural area locations was reported by 37.60% of drivers and, finally, around 3% of drivers regularly drove only in rural areas.

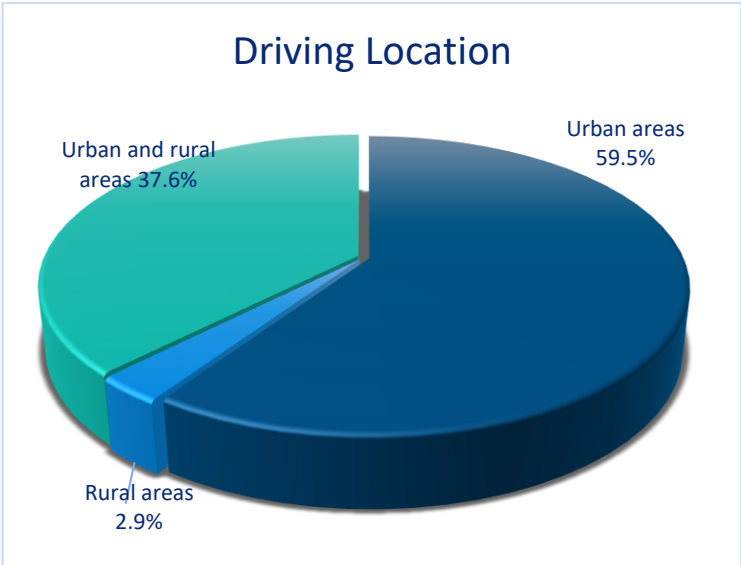


Figure 3: Driving location

Of the 64.30% of total participants who reported using a mobile phone while driving, around 48.50% used it for talking, followed by 19.30% who used it for road navigation.

Moreover, around 2.10% of participants used their mobile phone for texting while driving, while 0.80% used it for social media and video watching. Although these latter two percentages are very low, the overall impact could be devastating on ACT roads, considering that this study's sample comprised only 476 driver participants from the total population.

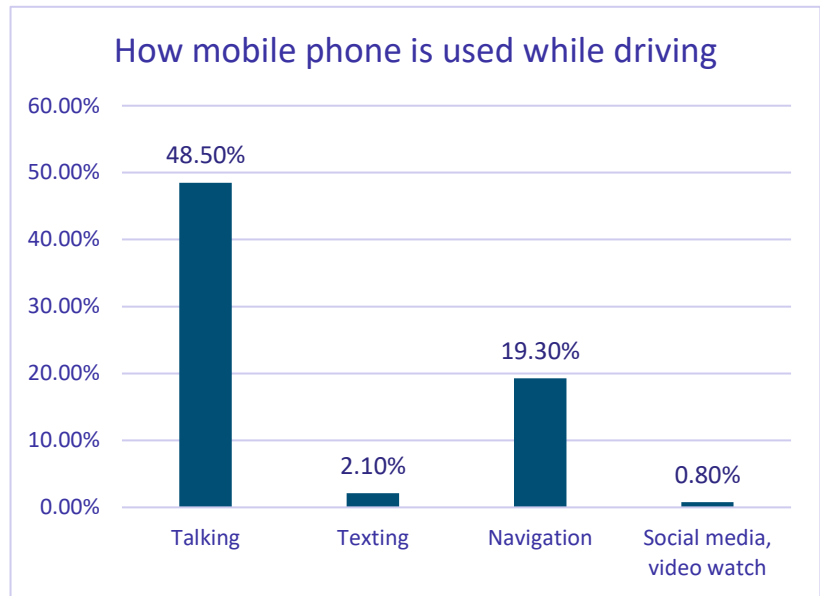


Figure 4: Mobile phone use

Regarding in-car noise, the radio was the most frequently reported source of noise or non-driving sound (by around 54.20% of participants). Around 4% of participants reported loud music and around 3% reported passengers' conversation as two other sources on in-car noise.

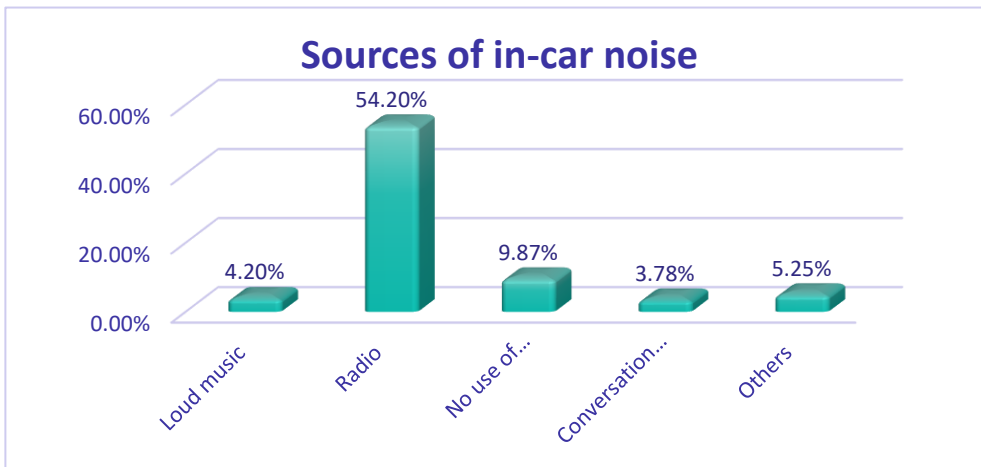


Figure 5: Sources of in-vehicle noise

Around 10% of participants reported that they did not play anything on their car's sound system.

Survey 1 also asked ACT driver participants about their usual driving times in a regular working week.

Results showed that around 50% of ACT driver participants were on the road at some time between 7.00 a.m. and 2.00 p.m. This might include mums and dads dropping their children to school and office workers and other individuals going to their workplace. On the other hand, only 3–10% of drivers were on ACT roads after 7.00 p.m. and before 7.00 a.m. Between 2.00 p.m. and 7.00 p.m., around 23–33% of driver participants were on the road.

*Did you know?
Around 50% of ACT drivers are on the road at some time between 7.00 a.m. and 2.00 p.m.?*

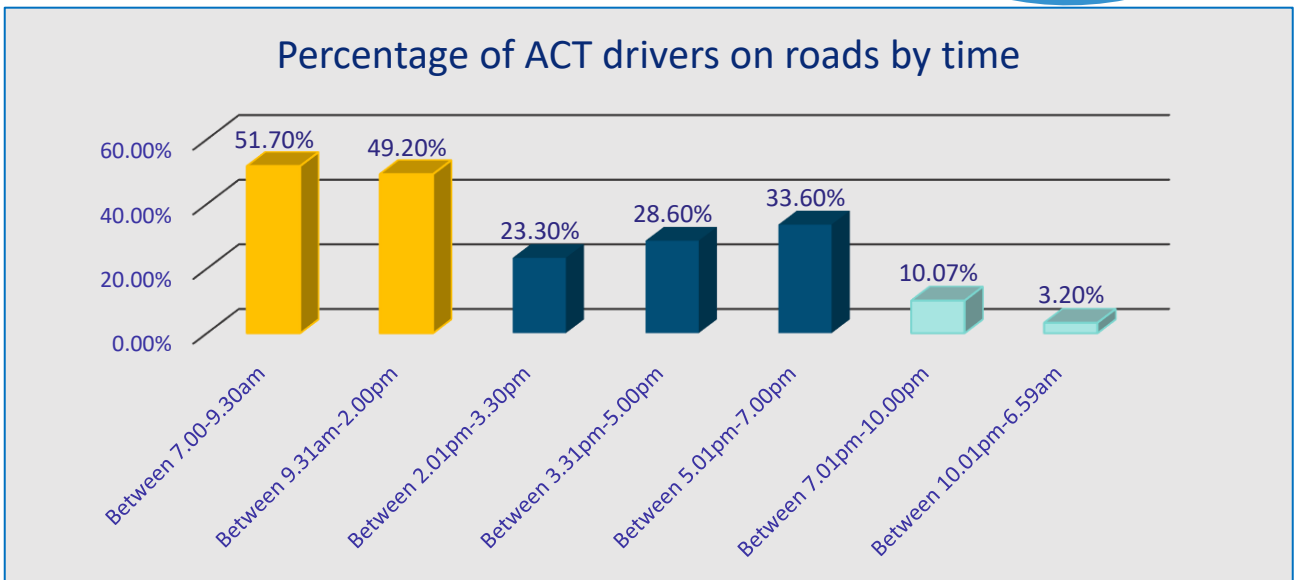


Figure 6: On roads by time.

Note: Categories are not mutually exclusive (i.e., total percentage will not equal 100%)

Most ACT driver participants (approx. 92.9%) reported usually driving around 1–2 hours per day in an average working week. The next largest group of participants (around 5.7%) reported that they drove from 3–5 hours per day in a regular working week.

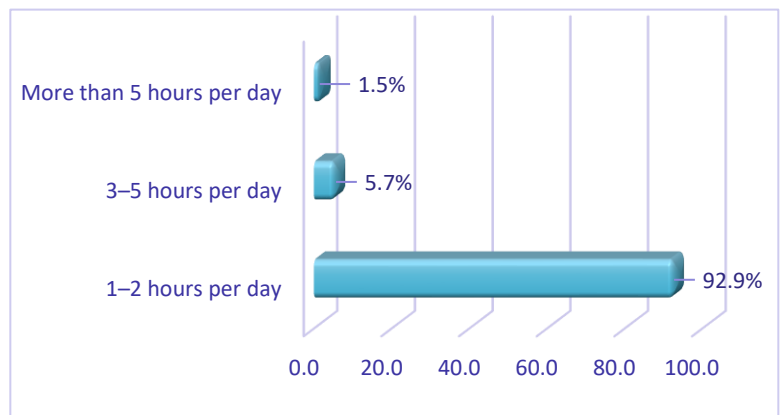


Figure 7: Average driving hours per day in a regular working week

Results from cluster analysis

Two separate cluster analyses were conducted using IBM SPSS Statistics data analysis software to capture scenarios based on the four types of distraction (auditory, visual, cognitive and behavioural/physical) and to gain an understanding of the cluster comprising mums and dads (given that most Survey 1 participants [around 65%] were parents). As shown in Table 1, values ranged from 1–5 (the lowest being 1 and 5 being the highest) and k-means clustering was used for the following items.

Cluster 1 results

Table 1: Clusters/groups by distraction type

Criteria	Clusters/groups			
	1: Behavioural/ Physical Distraction	2: Auditory Distraction	3: Cognitive Distraction	4: Visual Distraction
Most frequent in-car distraction				
Percentage (and number) of participants	29.40% (140/476)	28.20% (134/476)	24.80% (118/476)	17.60% (84/476)
Average value for perceived temporal distance	2.23	2.04	1.92	2.29
Average value for perceived spatial distance	2.16	2.00	1.93	2.24
Optimism bias	2.90	2.98	3.01	3.07
Average value for perceived behavioural control (PBC)	2.58	2.69	2.60	2.73
Average value for perceived self-regulation	3.87	3.84	3.79	3.94
Notes	High in self-regulation	Low in temporal and spatial distances	Lowest temporal and spatial distances	Highest optimism bias, self-regulation and PBC group

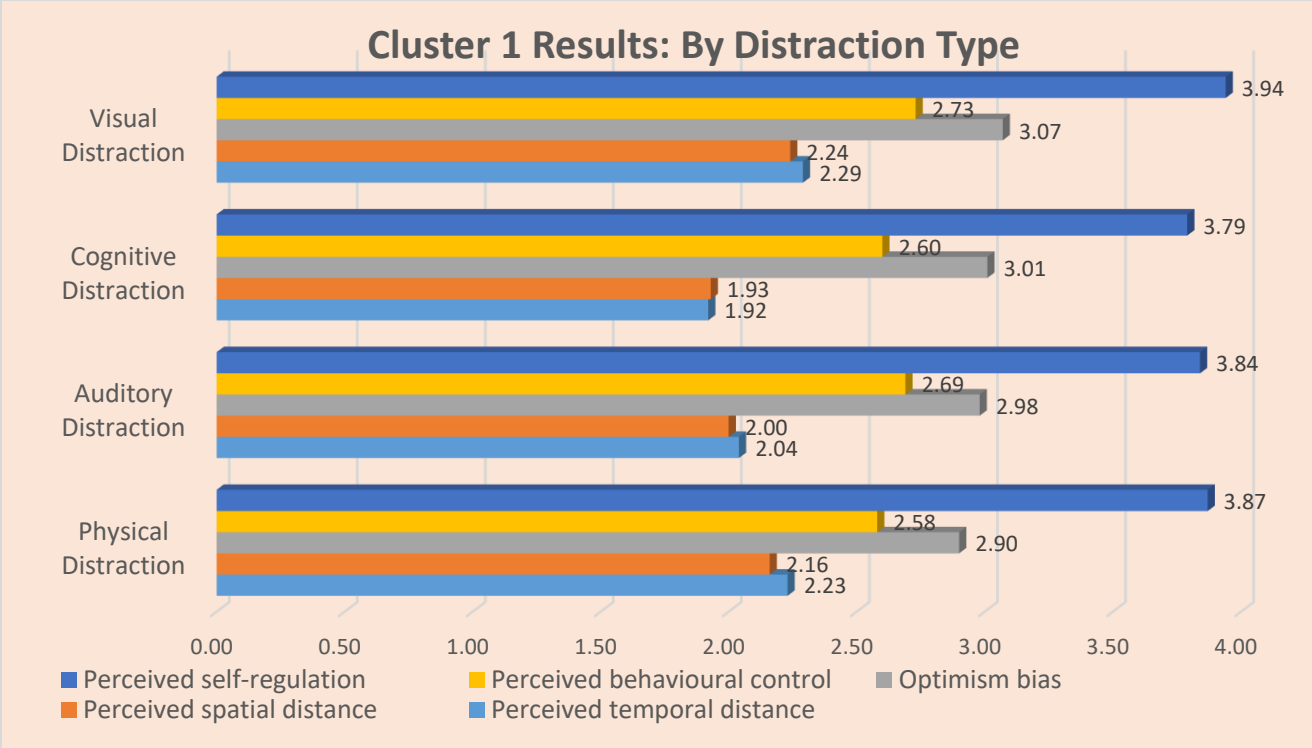


Figure 8: Cluster 1 results: by distraction type. Note based on Table 1 data.

The higher values for perceived spatial distance (2.16 and 2.24) and temporal distance (2.23 and 2.29) were for behaviourally/physically and visually distracted drivers, respectively. Analysis found that behavioural/physical (something to do) and visual (something to see) distractions were the most frequently reported types of driving distraction inside the vehicle. These two groups of distracted drivers also had the highest self-regulation belief (visually distracted group: 3.94 and behaviourally/physically distracted group: 3.87). This miscalculated high self-regulation could cause their visual or behavioural/physical distractions while driving and may lead to accidents.

Driver participants reporting visual distraction believed they could control a situation no matter what the circumstances (perceived behavioural control [PBC]) as they had the highest PBC value (2.73). They also had the highest level (3.07) of optimism bias (believing that nothing bad would happen to them; it would always happen to other vehicles or people) compared to the other groups of drivers. Finally, in-vehicle auditory and cognitive distractions had comparatively lower levels of adverse impact on spatial and temporal distance miscalculations, with

lower values of spatial distance (2.00 and 1.93) and temporal distance (2.04 and 1.92), respectively. These two groups of distracted drivers (auditory and cognitive) also had the least amount of perceived self-regulation (3.84 and 3.79), respectively, indicating that they were more cautious when driving than the other groups of drivers. The plausible explanation is that, unlike visually and behaviourally/physically distracted drivers, these drivers are looking at the road when they are thinking (cognitive) or listening (auditory). Therefore, it is possibly easier for them to switch their focus to the road situation if something unusual happens and requires immediate attention.

Cluster 2 results

Table 2: Clusters/groups by gender

Criteria	Clusters	
Percentage (number) of total participants	56.30% (268)	43.70% (208)
Gender	Male	Female
Percentage of parents	Dads: 68.70%	Mums: 63.00%
Average value of risk-taking attitude	1.58	1.38
Most frequent distraction in car	Behavioural/physical	Auditory
Average value of perceived behavioural control (PBC)	2.79	2.46
Intention of involvement in risky driving	1.28	1.21
Average value of self-regulation	3.81	3.91
Optimism bias	3.10	2.83
Note	Males including dads are more distracted by doing something inside the vehicle. So, they have a higher level of optimism bias.	Females including mums are more distracted by listening to something inside the vehicle. Thus, they have a lower level of optimism bias.

Note:*All values are between 1 and 5, where 1 is the lowest and 5 is the highest.

Male driver participants in general, perceived they had more behavioural control (PBC) (2.79) compared to female driver participants (2.46). This could be why males

including dads had a higher level of risk-taking attitude (1.58) compared to females including mums (1.38), as well as a higher intention of involvement in risky driving (1.28). Another reason for male driver participants' higher level of risk-taking attitude could be their higher level of optimism bias (3.10) compared to female driver participants (2.83). This higher level of optimism bias (i.e., nothing is going to happen to me or my vehicle) may generally make them more confident.

Interestingly, males (including dads) mentioned they were usually more distracted by doing something (behavioural/physical distractions) inside the vehicle, whereas females (including mums) reported they were mostly distracted by listening to something (auditory distractions) inside the vehicle, such as a baby crying, children shouting, passengers' conversations, etc.

Finally, females (including mums) had a lower level of optimism bias (i.e., anything could happen on the road to me or my vehicle) and lower perceived behavioural control (PBC) (less confidence in managing an unusual situation). However, this group reported more self-regulation (3.91) compared to the other group (3.81). Separate analyses on the relationship between males/females with distraction type as well as mum/dad with their distraction type are attached in Appendix I.

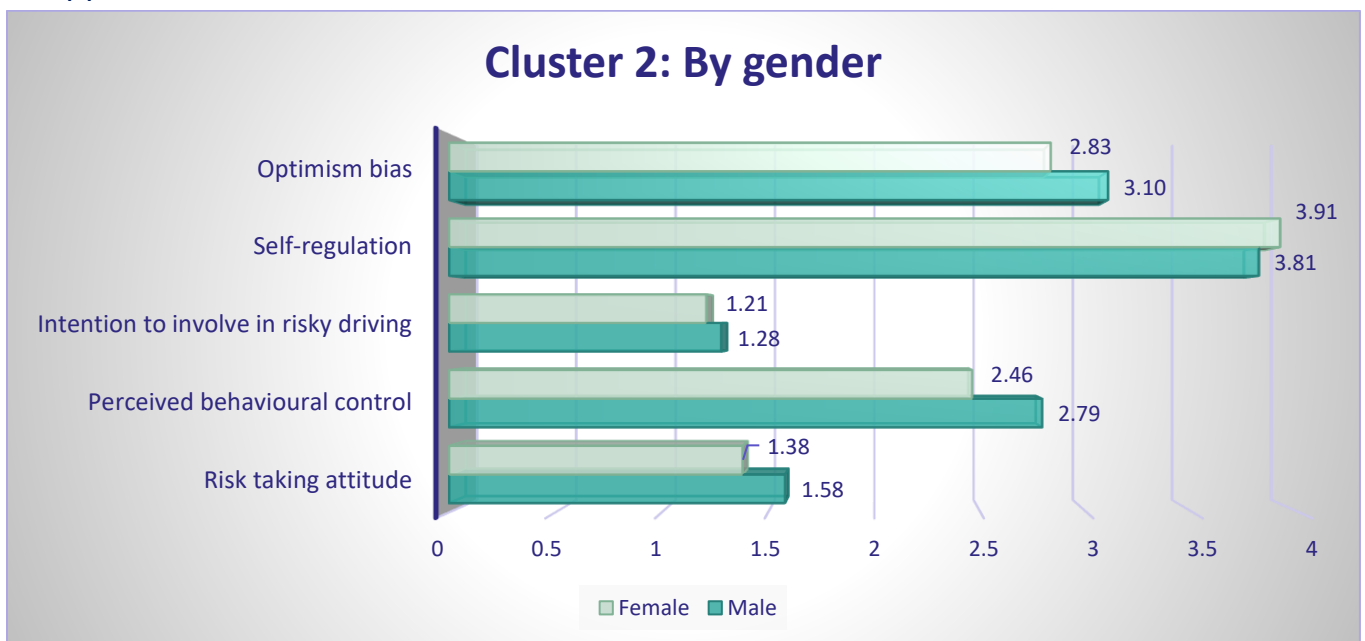


Figure 9: Cluster 2 results by gender. Note: based on Table 2 data.

Recommendations from Survey 1 findings for future social awareness campaigns

Recommendations

- In choosing media for future social awareness campaigns, radio advertising is highly recommended as any advertising messages are likely to reach drivers in their vehicles, given that most ACT driver participants reported that they listened to their car radio while driving.
- Similarly, if advertising messages are to reach drivers while they are driving, it is recommended that broadcasting time should be between 9.00 a.m. and 2.00 p.m. as around half the ACT driver participants were on the road at this time, most of whom were listening to their car radio. Radio advertisements are also often preferable to other traditional media choices. For example, television is a widely watched medium, but it has many channels, as well as YouTube and other entertainment platforms like Netflix, etc. which make it difficult to reach the targeted audience. Also, not everyone watching television will be the campaign's targeted ACT drivers.
- With Survey 1 findings reporting that most ACT driver participants usually drove in urban areas, future campaigns could target ACT roads and highways in urban areas. While other media choices, like billboards, signage or balloons with cautionary messages, are recommended in city areas or on roadside locations for future campaigns, they may also cause visual distractions. Thus, campaigns need to consider shorter messages, signs only (e.g., danger signs) or use only colours or photos due to their strong impact on drivers' minds without distracting their focus on driving.



- In terms of parents, as dads are more likely to be distracted by behavioural/physical distraction inside the vehicle compared to other types of distraction, advertising campaigns featuring dads and children and focusing on the ‘something to do’ message would be useful for spreading road safety awareness.

- Male driver participants overall had higher levels of optimism bias (the belief that nothing will happen to them or their vehicle), risk-taking attitude and intention for involvement in risky driving compared to female driver participants, as found in Survey 1. Thus, it is recommended that future advertising campaigns should either solely use male drivers or focus on the role of male drivers, along with other characters, to increase road safety awareness and reduce the rate of accidents.



- As Survey 1 found that the major distractions were behavioural and auditory, and considering the devastating effects of these distractions on miscalculating spatial and temporal distances, it is strongly suggested that future campaigns should include these two types of distraction in the content of road safety messages to raise drivers’ awareness.

Report on eye-tracking study

Aim

The eye-tracking study aimed to determine which aspects of road safety advertising received more attention. Unlike self-reported survey data, an eye-tracking study is a bias-free mechanism for collecting neutral data in a lab environment (Myers et al. 2020).



Method

The questionnaires for both the eye-tracking study and the driving simulator study were pre-tested by three academics with doctoral qualifications with their feedback sought on the questionnaires' wording, format, readability, etc. Based on their feedback, the questionnaires underwent minor changes and the final versions of questionnaires were used by participants.

Participants were invited to the lab at the University of Canberra (UC). After their arrival, they received a short briefing on what they could expect from this eye-tracking experiment. A demo test was then run to confirm that the eye-tracker was successfully capturing their eye movements. Eight advertisements conveying the importance of road safety were then shown in random order to participants. All advertisements were chosen carefully to cover a range of inside-car distractions; to portray a mix of old and young drivers; and to include male as well as female drivers. After all advertisements were shown to participants, the study's chief investigator double-checked all eye-tracking recordings.

Procedure

Participants were asked to look at the advertisements without body and head movements. As only eight advertisements were shown (on average, each was one minute in duration) with a total time of 8–9 minutes, participants did not feel

uncomfortable or bored. The eye-tracking set-up worked with participants who were wearing corrective eye lenses.

Analysis

Eye-tracking set-up and protocol

Eight message-based advertisements (ads) conveying the importance of driving without distractions (e.g., without looking away from the road while driving, conversing with car passengers or talking on a mobile phone) and with an average length of 53 ± 11 seconds were shown to 120 participants. All participants viewed the ads in random order on a 17-inch LCD monitor with 1920 x 1080 pixel resolution. The monitor was located 60 cm from the participant to maximise the visual angle of 35° in both horizontal and vertical directions. Participants' eye movements were recorded via the Eyetribe eye-tracker with a 30Hz sampling rate. The fixation detection module from the EyeMMV toolbox was utilised to extract fixation information from the gaze responses. A fixation point represents the screen location where the point-of-gaze remains within 2° visual angle for at least 100 milliseconds.

After setting the fixation coordinates, a Gaussian heat map with a standard deviation of 10 pixels was combined to generate fixation heat maps to identify facial areas with higher visual attention. All advertisements used human actors, with human faces attractive to participants' attention (Subramanian et al., 2010). An off-the-shelf Dlib face detector (Zhang et al., 2020) was used to find facial regions of interest. The proportion of the rate of participant fixation on characters' faces in the advertisements was calculated for each video.

Details of the advertisements are shown below in Table 3.

Table 3: Advertisement details and sources

Advertisements used	Content	Source
 <p style="text-align: center;">Ad-1</p>	<p>A female driver feels guilty for looking back at her child on the back seat.</p>	<p style="text-align: center;">YouTube</p>
 <p style="text-align: center;">Ad-2</p>	<p>A male driver has a superior ego about his driving skills and his over-confidence results in an accident.</p>	<p style="text-align: center;">YouTube</p>
 <p style="text-align: center;">Ad-3</p>	<p>A male driver was speeding due to his very light regard for the speed limit.</p>	<p style="text-align: center;">Transport Canberra & City Services (TCCS)</p>
 <p style="text-align: center;">Ad-4</p>	<p>A female teen driver was busy laughing and chatting with friends, resulting in an accident.</p>	<p style="text-align: center;">YouTube</p>

	<p>A female driver was busy with her mobile phone while driving. An accident occurred due to her distraction.</p>	<p>YouTube</p>
<p>Ad-5</p> 	<p>A male driver was speeding and received a speeding ticket. With his children, he witnessed a road accident, making him remorseful for speeding.</p>	<p>YouTube</p>
<p>Ad-6</p> 	<p>A female driver was talking with her partner on her hands-free phone, distracting her from the road.</p>	<p>YouTube</p>
<p>Ad-7</p> 	<p>A female driver was talking with her partner on her hands-free phone, distracting her from the road.</p>	<p>YouTube</p>
<p>Ad-8</p>	<p>A male driver, running late for a business meeting, was speeding and broke traffic rules, resulting in an accident.</p>	<p>YouTube</p>

Eye fixations on faces to find gender differences

Of the eight ads presented to create participant awareness, the study revealed an average of 31.07 ± 7.38 eye fixations per participant and ad video, as well as an average of 4.46 ± 3.76 fixations over facial regions per participant and ad video. These values meant that: (1) other interesting objects were attracting visual attention; (2) incorrect facial region detections; and (3) noisy point-of-gaze estimates by the eye-tracker. This translated to a mean of $16.2 \pm 14.3\%$ per participant and ad video. Figure 10 presents examples of advertisement frames with multiple actors.



Figure 10: Examples of video frames illustrating detected faces via *Dlib* (denoted by green rectangles) Note that eye-fixation heat maps are superimposed (hotter regions are encoded in reddish shades, while cooler regions are encoded in blue).

Male participants, on average, recorded 28.76 ± 7.20 eye fixations per ad, whereas female participants recorded 33.48 ± 8.51 fixations per ad video. Therefore, female participants had a significantly higher number of eye fixations per ad compared to male participants, as shown in the two-sample *t*-test ($t(971) = -3.7208$, $p < 0.005$). Female participants also had more fixations on faces than their male counterparts ($t(971) = -2.249$, $p < 0.05$) but without any significant difference in terms of the percentage of fixations on faces over the viewing duration ($t(971) = -0.3411$, not significant [ns]).

As an equal distribution of male and female drivers was portrayed in the ads, the study next examined if fixation patterns varied with respect to driver gender. While ads portraying male drivers attracted greater cumulative fixations (35.02 ± 23.43) compared to ads portraying female drivers (31.89 ± 21.30), the differences were not

significant ($t(486)=1.5428$, ns). However, the number of facial eye fixations on male drivers in ads (6.18 ± 8.26) was greater than on female drivers in ads (3.65 ± 4.17), with this being a significant difference ($t(486)=4.2627$, $p<0.0001$), indicating that male drivers in ads attracted greater visual attention from participants. Similarly, male drivers in ads received a significantly higher percentage of facial fixations (19.91 ± 23.65) than female drivers in ads (13.83 ± 14.14) in the two-sample t -test ($t(486)=3.4459$, $p<0.001$).

Perception differences between single versus multiple characters in ads

Considering that human faces have had a crucial impact on audience attention in previous eye-tracking studies (Subramanian et al., 2010), the current study attempted to reveal differences in participants' perception over single actors or multiple actors in road safety advertisements. The two-sample t -test result ($t(919)=-2.017$, $p<0.05$) showed a significant difference, with a higher score for multi-actor ads (4.89) compared to single-actor ads (4.01). In addition, the focus on faces was also higher for multi-actor ads (18.9%) than for single-actor ones (14.6%).



Figure 11: Snapshot identifying faces with green rectangles and blue to red shades for the heat map

Interestingly, while all participants' responses toward single-actor ads versus (vs.) multi-actor ads were significant, the number of female participants' facial fixations was significantly higher ($t(486)=-2.8813$, $p<0.005$) for multi-actor ads (5.6) than for single-actor ads (3.8). The female participants' percentage for facial fixations was significantly higher for multi-actor ads (19.40%) than for single-actor ads (12.60%), ($t(486)=-3.7461$, $p<0.0005$).

Impact of age on ads

This section did not use direct eye-tracking data, instead using the data from questionnaires completed by participants after watching all the ads in the eye-tracker. The questionnaire asked several questions; for instance, participants' attitude to the ads was measured by asking their feelings about the ad, that is, 'good', 'pleasant', 'favourable', etc. Their intention to adopt the safety messages in the ads was determined by asking 'plan to', 'willing to' and 'intend to follow' the safety messages. Findings from multi-group analysis (Fatima et al., 2023) using SMART PLS3 software (Henseler et al., 2016) confirmed a significant role of age on the attitude–intention link (p -value difference=0.037). The current study found that older individuals (t -value=7.867) had a greater urge to adopt safety messages compared to younger ones (t -value=1.221).

Examination of awareness messages

After each ad, an on-screen question asked participants whether or not they noticed an awareness message. In the total set of ads, 50% of ads did not have an awareness message and 50% of ads did. Therefore, this procedure checked participants' attention toward the ads' messages. Participants were asked to respond with the options: *yes*, *no* or *unsure*. Based on participant responses, the current study computed the following measures:

True positive rate (TPR): The proportion of instances where the ad displayed an awareness message and the participant responded with a *yes* option.

False positive rate (FPR): The proportion of instances where the ad did not display an awareness message and the participant responded with a *yes* option.

False negative rate (FNR): The proportion of instances where the ad displayed an awareness message and the participant responded with a *no* option.

True negative rate (TNR): The proportion of instances where the ad did not display an awareness message and the participant responded with a *no* option.

Results in the matrix shown in Table 4 below summarise the mean values of these four measures.

Table 4: Eye-tracking results

	<i>Participant pressed yes</i>	<i>Participant pressed no</i>
<i>Ad displays message</i>	TPR=0.95	FNR=0.05
<i>No message display in ad</i>	FPR=0.10	TNR=0.90

Participants' greater propensity to perceive the social awareness message when it was displayed. The study also computed the percentage of time for which eye fixations focused on the awareness messages when these messages were displayed (four ads had an awareness message shown in Figure 12). The mean percentage of fixations on awareness messages for participants who correctly perceived a visual awareness message was $85\pm 5\%$, while for those who did not perceive a message, it was $4\pm 1\%$.

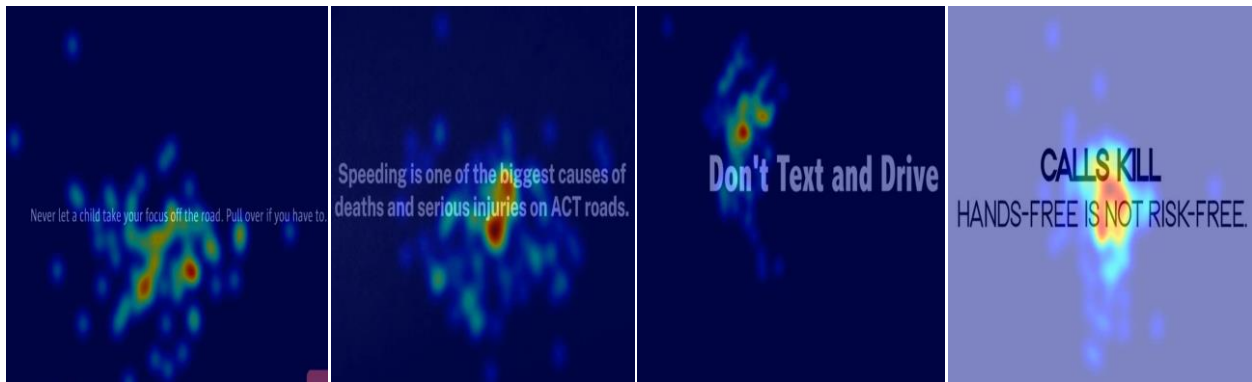


Figure 12: Four ads with a visual awareness message Notes: these messages are shown with eye-fixation heat maps superimposed. Sparsely to densely fixated regions are denoted via blue to red shades via the heat map (best viewed under Zoom).

Discussion

Both male and female participants gave similar visual attention to human actors and their actions in the road safety awareness ads. However, female participants explored the scene in more detail, while male participants dwelled longer on their fixation locations. In summary, the eye-tracking study confirmed that participants found the presented ads visually engaging as they attracted their visual attention. Female participants wanted to explore the ad content while male participants spent longer time intervals in a specific ad region. Interestingly, participants' visual attention was higher if a male driver was shown in ads rather than a female driver. This was true for both male and female participants.

The eye-tracking study also found that multi-actor ads received greater attention (with eye fixations on faces equated as attention) compared to single-actor ads. Also, female participants had greater likelihood of focusing more on multi-actor ads than male participants.

In addition, in line with a prior finding that older drivers were cautious, professional and received fewer penalties than younger drivers (Hamido et al., 2021), this study's findings confirmed that older drivers were more inclined to adopt safety messages from road safety ads.

As all the displayed ads conveyed various levels of negative emotion, given that they demonstrated the hazardous effects of distracted driving, the observed results were largely consistent with observations with a previous study (Subramanian et al., 2014). The fact that the overall gist or theme of a scene was retained in the memory rather than the scene details (Subramanian et al., 2014) explained why participants were led to believe what they did regarding the presence of a social awareness image. Overall, the observed results confirmed the effectiveness of the ads employed for social awareness in our study.

Finally, a relatively low false negative rate (FNR) (i.e., participants perceived the absence of a message even when it was present) was noted. The high percentage of fixations on text for participants who correctly identified a visual message revealed that explicit attention aided recognition. Text is known to attract substantial visual attention, with this observed in several studies (e.g., Judd et al., 2009). Conversely, the low percentage of fixations noted for participants who missed the visual messages indicated that they may have been cognitively distracted by the strong emotional content that preceded the messages.

Report on driving simulator study

Aim

The driving simulator study was used to investigate whether different types of distraction impacted differently on individuals, depending on their self-reported vulnerability to distraction. The study considered it important that predictions of interactions between vulnerability type and types of distraction were tested in realistic scenarios, rather than relying solely on using self-reported measures. Driving simulators are a great tool as they allow the collection of objective data in a safe environment. Researchers can manipulate distractions while participants drive in an ethical and safe manner.

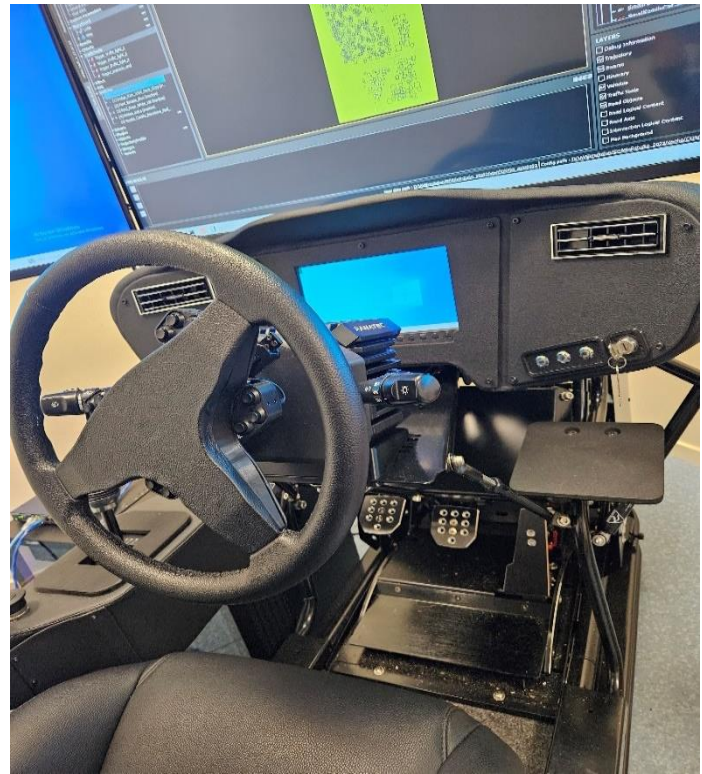


Figure 13: Photograph of part of driving simulator in lab research room. Photo taken by researchers.

Method

Complete data sets were collected from 103 individuals (age range 16–82, median age 35 and mean age 39; and 53 females, 48 males and 1 non-response). Of these individuals, 27 self-reported being most vulnerable to distractions by verbal content (a type of cognitive distraction), 23 by visual content, 27 by auditory content and 23 by behavioral/ physical activities in the car. Before they arrived at the simulator, they filled out a short questionnaire that informed the researchers about the key details of participants.

Procedure

All testing was conducted at the University of Canberra (UC) on-campus clinics. The UC clinics have a custom-designed driving simulator by Hyperdrive (Figures 13 and 14) to resemble the interior of a regular car. It has three pedals, a gear shifter, indicators and a steering wheel. The simulator software runs on SCANNER by AVSimulation, and is programmed to respond in an intelligent way to changes in the environment. The driving environment appears on three screens, providing near 180° peripheral vision. The car was set to automatically shift gears, and thus participants only used two of the three pedals.



Figure 14: Photograph of driving simulator in clinical research room. Photo taken by researchers in the actual lab

Participants had a brief familiarisation session during which they could freely drive through a virtual town. This helped them to become used to the driving simulator, including the steering wheel and braking behaviour. The experimental session was then conducted. This session consisted of four straight sections of road, with intersections dividing the four sections. Two intersections had traffic lights which were set up to turn red when the driver was approaching. The third intersection had a give-way sign. During each of the four sections, drivers were distracted through one of four means (see Table 5).

Table 5: Details of simulator study

Type of Distraction	Time	Location on the map
Verbal distraction	5 seconds after the start	N/A
Visual distraction	20 seconds after the start	Just before the first traffic light
Auditory (ringing phone) distraction	30 seconds after visual distraction	At the start of the second straight section
Physical (cup) distraction	Towards the end	Just before the end of the track

Distractions were all jointly conducted by a research assistant and the study’s chief investigator. Verbal distraction was implemented by engaging participants in a forced conversation while they were driving in the simulator. Conversation started with general questions like ‘what are you doing?’ and then when the driver reached a certain position on the road, the conversation finally ended. Visual distraction was conducted by asking participants to look at a specific key on the keyboard (‘enter’ key) with a fake message about it. The message was, ‘if any pop-up message comes on your screen, please press this enter button’. Thus, participants had to move their eyes from the simulator screen to look at the keyboard placed on the side table. Auditory distraction was conducted by calling participants’ mobile phone. Researchers collected participants’ mobile number before they entered the simulator and asked participants to not put their phone on silent when they drove. Thus, the loud ring tone was an auditory distraction for participants. Finally, the physical/behavioural distraction involved asking participants to move a paper cup from one side of the table to another place (from right to left or the other way around) while they were driving.

Analysis

The influence of the distractions was operationalised as the ability to keep the car steady, calculated as the standard deviation of lane position (SDLP) which can be thought of as the “sway” of the car. This is a standard and very sensitive measure

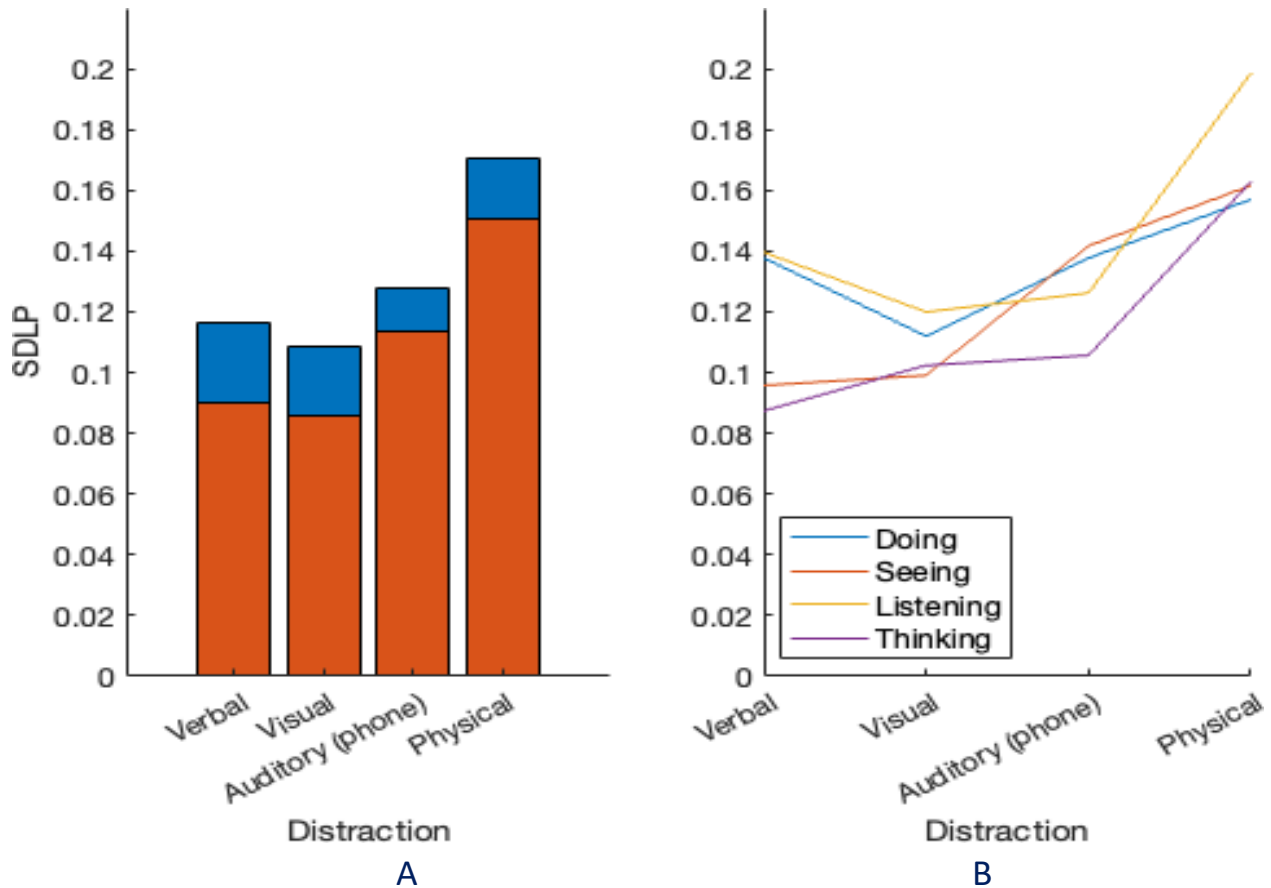
used in driving research to measure automatic driving behaviour (i.e., not a cognitive decision to slow down or overtake) (e.g. van Dijken et al., 2020).

The distractions could not always be precisely timed due to variability in individuals' driving style and their interaction with the researchers (e.g., asking a question). Therefore, the SDLP was calculated over a 200-metre stretch of road around the time of each distraction.

Findings

The largest sway in the car's position occurred with the physical distraction. In the current study, this involved moving a cup in the simulator, but, in real-life conditions, this could be operating a phone, changing mirrors, setting up a navigator, etc. The second largest sway was observed when the participant's phone rang (auditory distraction). The verbal (cognitive) and visual distractions caused the least sway (Figure 15a) overall.

The study's data provided input to a mixed generalised linear model, with distraction as the factor, the SDLP as the dependent variable, and individuals as the random factor. As the data were not normally distributed and were bounded by zero, a Gamma distribution with a log link function was chosen. This analysis showed a main effect of distraction ($\chi^2(3)=61.4$, $p<0.001$). When comparing the different distractions to each other, verbal and visual distractions were not significantly different ($p=0.995$), the auditory phone distraction led to a significantly higher sway than the visual distraction ($p<0.001$), while the physical distraction was significantly higher than the auditory distraction ($p<0.001$).



Figures 15A and 15B: Standard deviation of lane position (SDLP), types of distraction and vulnerability
 Panel A: average SDLP (in blue), and the median SDLP (in orange), averaged over participants, for the four types of distraction. Panel B: shows the same data, split into the four groups of vulnerability into which participants were categorised.

Researchers next analysed the SDLP dependent on the type of vulnerability (Figure 15B). The same analysis was run again, but now it also included as the factor, the vulnerability type, as well the interaction between the type of distraction and the vulnerability type. While the type of distraction was still significant ($\chi^2(3)=81.2$, $p<0.001$), neither the vulnerability type ($\chi^2(3)=0.52$, $p=0.91$) nor the interaction were significant ($\chi^2(9)=7.88$, $p=0.55$).

Additional findings

Additionally, a short questionnaire was provided to participants immediately after their experience in the driving simulator with several questions about participants' attitude or intention for involvement in risky driving to capture their responses.

Multi-group analysis (Fatima et al., 2023) using SMART-PLS3 software (Henseler et al., 2016) revealed that male and female participants had a significant difference in their attitude–intention link ($p=0.029$). Surprisingly, when female participants developed a risk-taking attitude, they had a higher intention for involvement in risky driving than male participants with a similar level of risk-taking attitude.

Discussion

The analysis showed that different types of distraction resulted in different levels of sway in driving, with physical distractions leading to the largest sway, followed by a personal phone ringing (auditory distraction), and finally visual and verbal distractions. No dependence was placed on self-reported vulnerability to different types of distraction and, counter to the hypothesis, within our current sample, no difference was reported on the extent to which people were distracted by different types of distraction based on their self-reported vulnerability type.

Overall, these findings suggested the importance of minimising certain types of distraction, with physical and auditory (phone) distractions, having the strongest influences on this measure and, hence, relatively large effects on driving behaviour.

The lack of interaction between the types of distraction and the vulnerability type was not expected, but it is possible that the way that vulnerability type was identified was not sufficiently powerful to effectively differentiate the groups. Self-



reported measures were used to identify vulnerability type, while possibly more objective measures, or a more comprehensive self-reported assessment, would yield more accurate classifications and, therefore, possibly a significant level of interaction.

Overall, the findings suggested that individuals categorised themselves as a particular vulnerability type, but they may be affected by other types of vulnerability of which they are unaware. Many individuals may not have insight into what most distracts them, possibly preventing them from implementing the appropriate precautionary measures. Further analysis on driving simulator self-reported study is summarised in appendix III.

Recommendations for future social awareness campaigns from eye-tracking and driving simulator studies

Recommendations from eye-tracking study

- Interestingly, the eye-tracking study findings showed that female participants covered advertisement content as a whole and tried to cover ‘most sections’ of an ad. On the other hand, male participants dwelled on specific regions for a longer time, assimilating key happenings in the ad in more depth. However, both male and female participants devoted comparable and adequate attention to facial regions over the video duration, implying that they carefully attended to the driver’s actions and that the driver awareness messages were adequately engaging. The implications for future awareness



studies are that future promotions should largely focus on the driver's facial expressions as they are the most engaging section of an advertisement. Also, advertisements targeted at female drivers may cover a range of sections/content to maintain their continuing interest, but advertisements targeted at male drivers should be limited to a few main sections/contents with one single message. Possible reasons are that male drivers need more time to process the whole advertisement as they observe each section in detail or they do not become engaged promptly, as is the case with female drivers (the exact reason is a topic for future research).

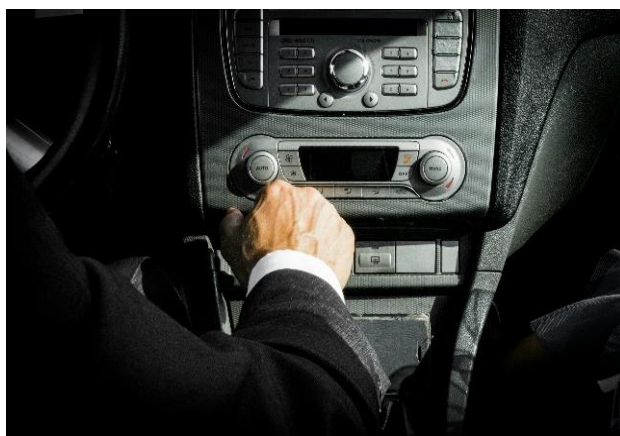


- Another finding was that participants were more engaged with advertisements showing male drivers than those that portrayed female drivers. Several possible causes for this finding include that males convey a serious image as a driver, or that they appear to be more related to work. However, this remains a topic for future research. In this case, it is recommended that future promotions should highlight male drivers if the promotional message appeal is more fact based, or work or profession related, to ensure greater audience engagement. The photo above provides an example.
- Senior drivers are often assumed to be slow or incapable of cognitive processing of an advertising message. However, our additional finding from observation while conducting the experiment (not based on eye-tracking analysis) was that senior drivers' capability to view advertisements and process messages varied significantly, with cognitive capability not having a linear relationship to their age.

- Multi-actor ads received more attention than single-actor ads, especially from female participants. This finding implied that future campaigns should include more actors/characters in advertisements than solely a single actor or character. However, future research can consider the effect of appearance sequence of the characters in the advertisements.
- Campaigners in future should be cautious about the level of emotion evoked in their advertisements. The eye-tracking study confirmed that participants often missed safety messages through the distraction of intense emotion.

Recommendations from driving simulator study

- Future promotions need to be focused on reducing in-car physical or behavioural activities, as the driving simulator study found that a physical activity inside the car was the leading cause of distraction. It caused the highest lane deviation which involved both spatial and temporal distance miscalculations by participants. A larger lane deviation was interpreted to mean that participants could not accurately measure the spatial and temporal distances when driving.



- The second leading cause of distraction was auditory distraction. Thus, future awareness programs should encourage ACT drivers to minimise auditory distraction inside their vehicle while they are driving. This category includes the driver's own


mobile phone ringing, in-car noise, children crying, high volume music, etc.

- Awareness campaign promotions should highlight the limited self-awareness of drivers. The study's findings confirmed that participants often misunderstood their own capabilities and vulnerability, leading them to take risks based on their miscalculations. For example, if a driver believes he/she is not affected by auditory distraction, the driver may allow noise inside the car while driving, even when it is objectively a strong distraction for him/her.
- As with the eye-tracking study, the driving simulator study provided the researchers with additional observational findings. The study found that it was a misconception that senior drivers were not capable of driving as well as young drivers and that their cognitive abilities for spatial and temporal distance were not as accurate as for young drivers. The researchers observed that senior drivers were often more capable of accurate driving in the simulator compared to younger drivers. Driving capability was also not found to be commensurate with chronological age. Thus, future awareness programs should be inclusive of senior drivers as they represent a key demographic of the ACT driving community.

Report on Survey 2

Aim

The aim of Survey 2 was to suggest social awareness campaign strategies by focusing on ACT drivers' media habits and road safety-related promotional messages. To achieve this aim, the study had several objectives:



*Did you know?
More than half the
total ACT drivers
(66%) usually drive
alone in their car.*

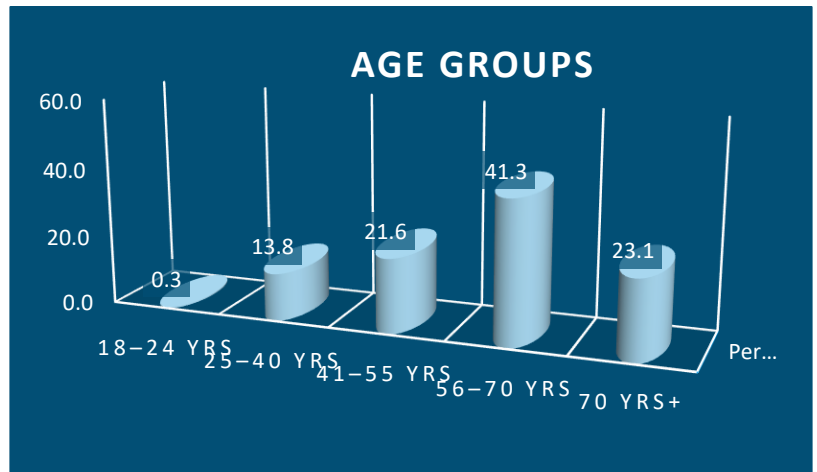
- To understand the media (i.e., television, radio, etc.) most used by ACT drivers and, therefore, to use their media preferences to guide future media strategies.
- To examine the type of message appeal (i.e., informative, emotional, story-based, etc.) that receives more attention from ACT drivers.
- To know the most influential types of advertising message (i.e., based on fear, humour, suggestion, etc.) for road safety campaigns to maximise the influence on ACT drivers, increasing their adoption of the messages given in advertisements.
- To explore whether road safety advertising content ending with positive outcomes or negative outcomes is more preferred from ACT drivers.

Method

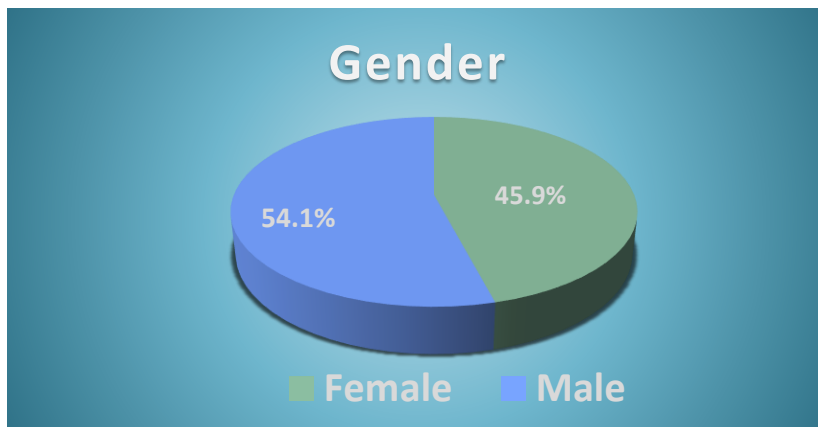
With the help of a professional research firm, an online survey was conducted among 320 ACT drivers. A 5-point Likert-type scale (where 1=most unlikely and 5=most likely) was used for most questions. Additionally, demographic questions were included in the questionnaire. While key findings are shown in next section, a few additional findings are summarised in Appendix VI.

Key findings

- The distribution of the age groups of participants was 35.70% aged 18–55 years while the rest, those above 55 years, comprised 64.30%.



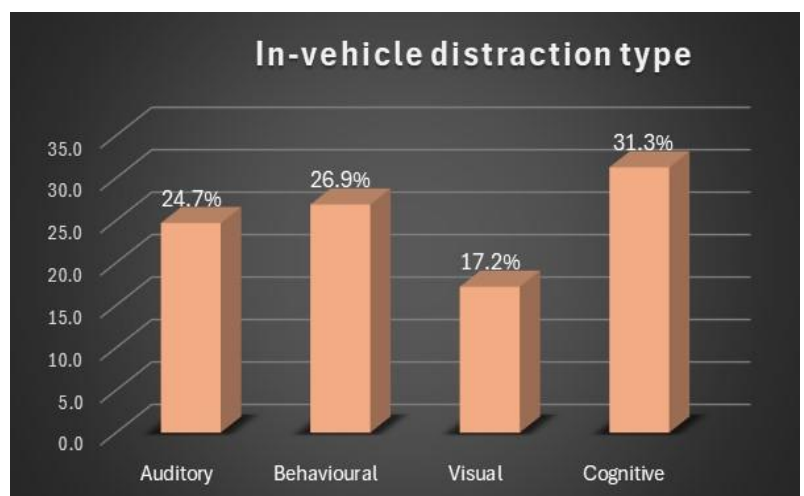
Figures 16: Age distribution



- The gender of participants comprised a good balance of males (54.10%) and females (45.90%).

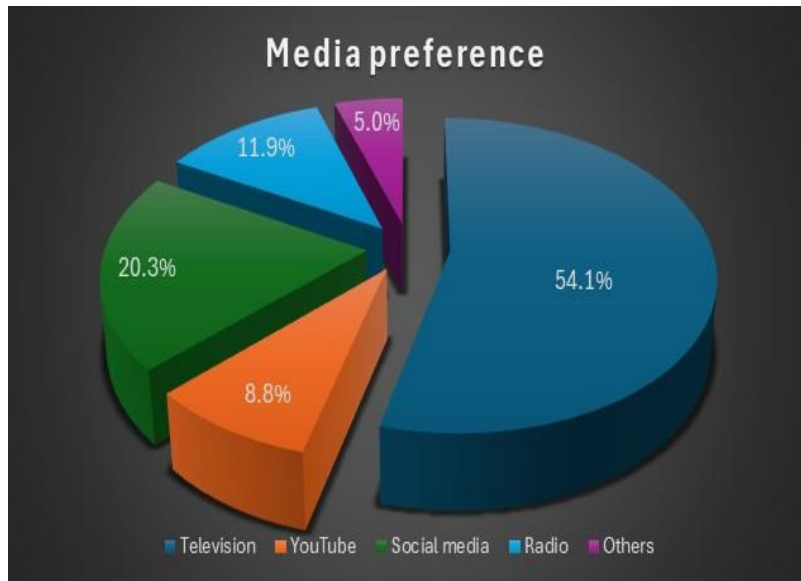
Figures 17: Gender distribution

- Regarding the query about self-reported in-vehicle types of distraction, more participants were distracted by cognitive distraction (31.30%), followed by behavioural distraction (26.9%). Then, auditory distraction was third (24.7%) and, finally, the least percentage of participants were distracted by visual distraction (21.20%).



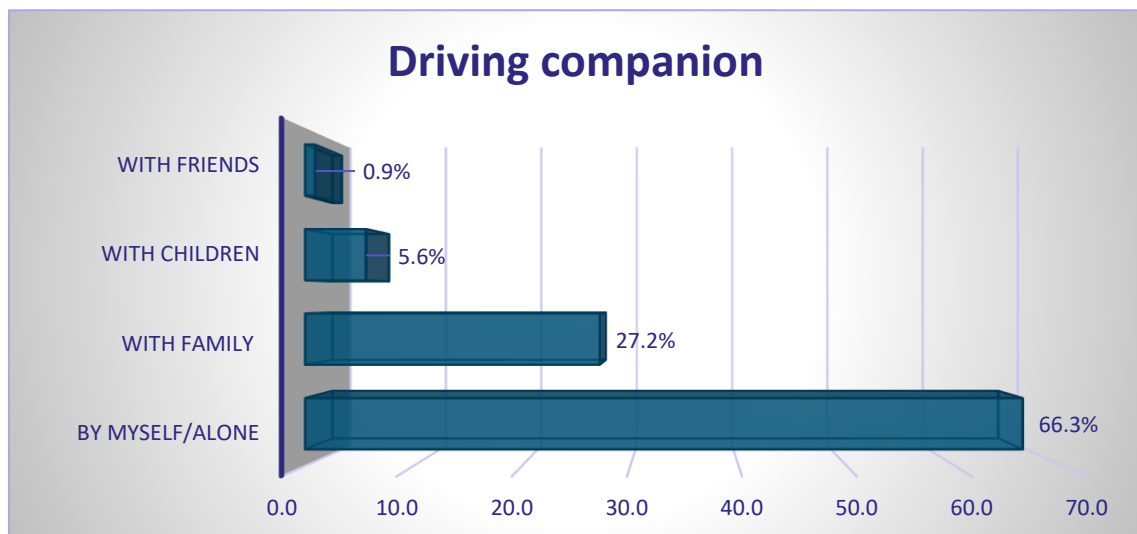
Figures 18: In-vehicle distraction type

- Findings showed that the most preferred media among ACT driver participants was television (54.10%), followed by social media (20.30%). Radio (11.90%) and YouTube (8.80%) ranked next in order.

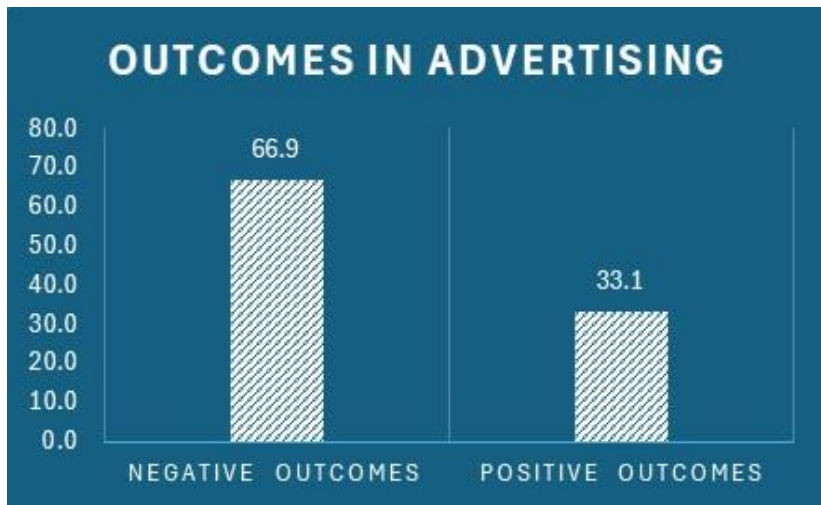


Figures 19: Media preference

- It was revealed that most ACT driver participants usually drove alone (66.30%), followed by 'with family (other than children)' (27.20%). The group, 'driving with children', was represented by 5.60% participants.



Figures 20: Driving companion



- Most participants expected to see negative outcomes (66.90%) in road safety advertisements rather than advertisements with positive outcomes (33.10%).

Figures 21: Outcomes in advertising

Survey question (1):

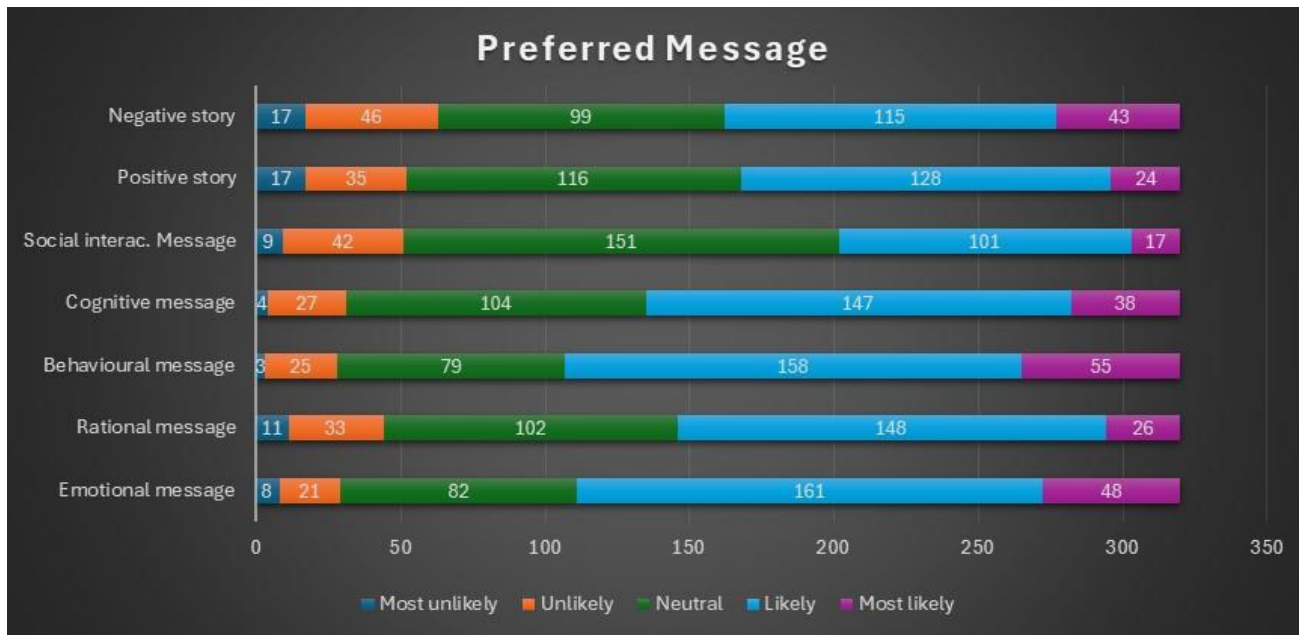
When you see a road safety advertisement, what type of message draws your attention more?

This question was asked about the type of message in road safety advertisements that participants preferred more in terms of attracting their attention. Participants rated 'most unlikely' to 'most likely' options for each type of message. A list of the message types with examples of slogans is shown below:

Scale from 1–5, where 1=most unlikely and 5=most likely
A. 'Emotional' message (e.g., "Drink, drive, die in a ditch")
B. 'Rational/informative' message (e.g., "Casual speeding, every K counts")
C. 'Cognitive/thinking'-focused message (e.g., "You won't see it coming")
D. 'Behaviour'-focused message (e.g., "It's not that important. Don't text and drive")
E. 'Social interaction'-related message (e.g., "Stop kidding yourself")
F. 'Story'-based message with positive ending (e.g., "Driving home from shopping centre with kids, an electric scooter crosses the car's path; due to high speed, last-minute hard braking is needed ... and a crash is avoided")
G. 'Story'-based message with negative ending (e.g., "Driving home from shopping centre with kids, an electric scooter crosses the car's path; due to high speed, the car driver could not brake in time ... and the car crashes")

Sources: www.transport.nsw.gov.au/roadsafety/resources/marketing-campaigns#Marketing_campaigns
www.tac.vic.gov.au/road-safety/tac-campaigns; streetsmarts.initiatives.qld.gov.au/initiatives/is-it-worth-it/

Findings revealed that the most preferred were emotional or behavioural messages. The least favourite were messages showing social interaction or cognitive-focused messages. Interestingly, participants preferred to see positive stories compared to negative ones in road safety advertising.



Figures 22: Preferred message

Survey question (2):

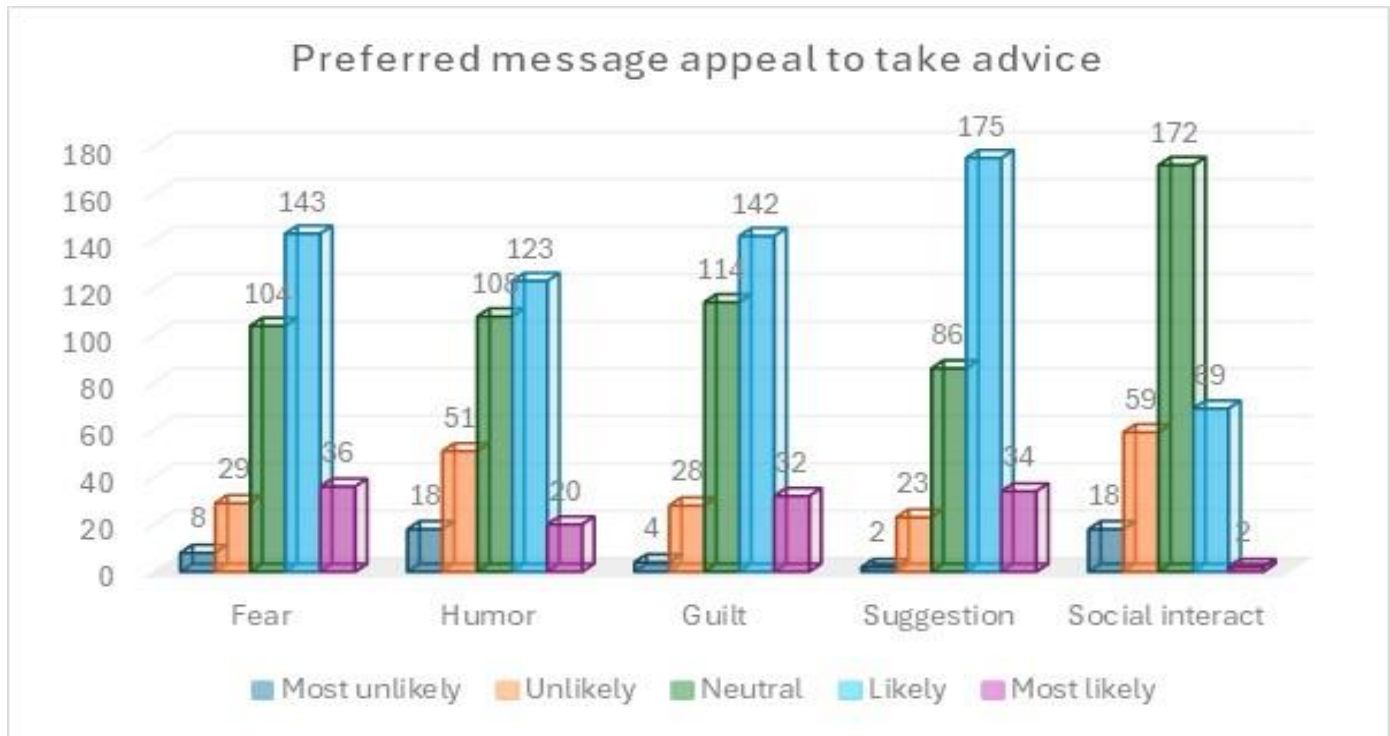
What type of road safety advertising message motivates you to adopt the advice given?

Participants were also asked which type of message appeal motivated them more to adopt the advice given in the road safety advertisements. In this case, they had several options as below:

- | |
|---|
| A. 'Fear' message (e.g., "Stop it or cop it") |
| B. 'Humour' message (e.g., "Drive hammered, you'll get nailed") |
| C. 'Guilt' message (e.g., "Is it worth it?") |
| D. 'Suggestion' message (e.g., "Don't trust your tired self") |
| E. 'Social interaction' message (e.g., "Go together") |

Sources: www.transport.nsw.gov.au/roadsafety/resources/marketing-campaigns#Marketing_campaigns
www.tac.vic.gov.au/road-safety/tac-campaigns
www.streetSMARTS.initiatives.qld.gov.au/initiatives/is-it-worth-it/

The study findings indicated that participants were motivated to take the advice of road safety advertisements by suggestion (209 of 320 participants reported this as either 'likely' or 'most likely') as the most preferred message appeal, followed by fear (179 of 320 participants reported this as either 'likely' or 'most likely') . The least influencing appeal was social interaction (only 71 of 320 participants reported this as either 'likely' or 'mostly likely').

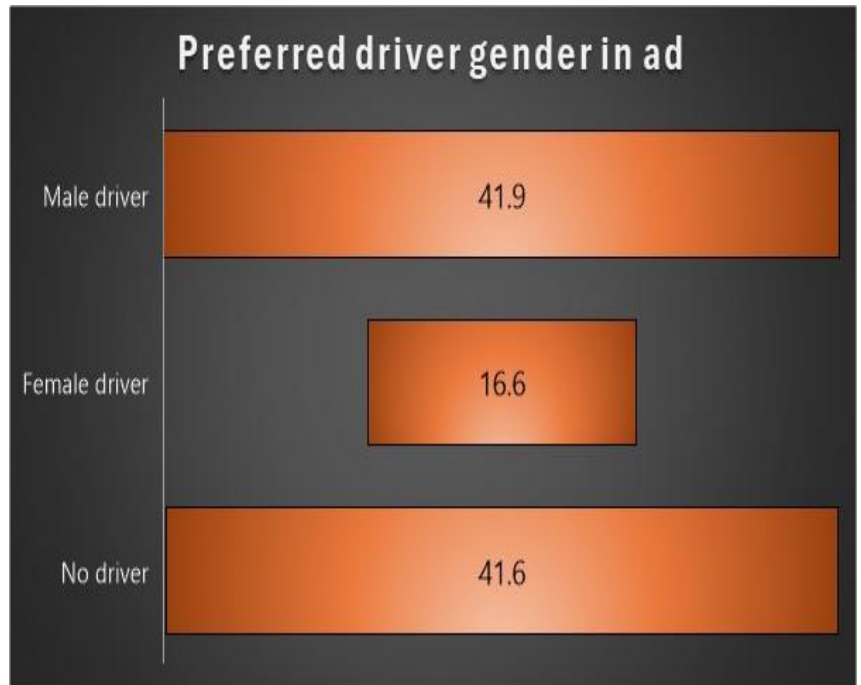


Figures 23: Age distribution

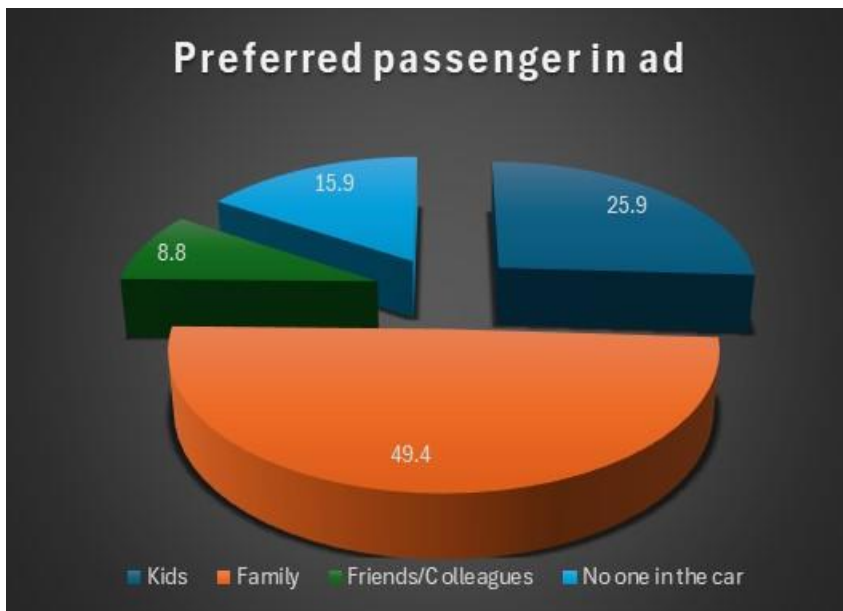
Survey question (3):

In an ideal road safety advertisement, what would you like to see?

In the eye-tracking study, participants were shown to perceive male and female drivers in advertisements differently; therefore, a gender-related query was included in Survey 2. Consistent with the eye-tracking finding, results showed that participants most preferred to see male drivers (41.90%) in road safety advertisements followed by 'no driver' at all (which also includes driverless cars). Finally, female drivers were the least preferred (16.6%) of these three options.



Figures 24: Preferred gender in ad

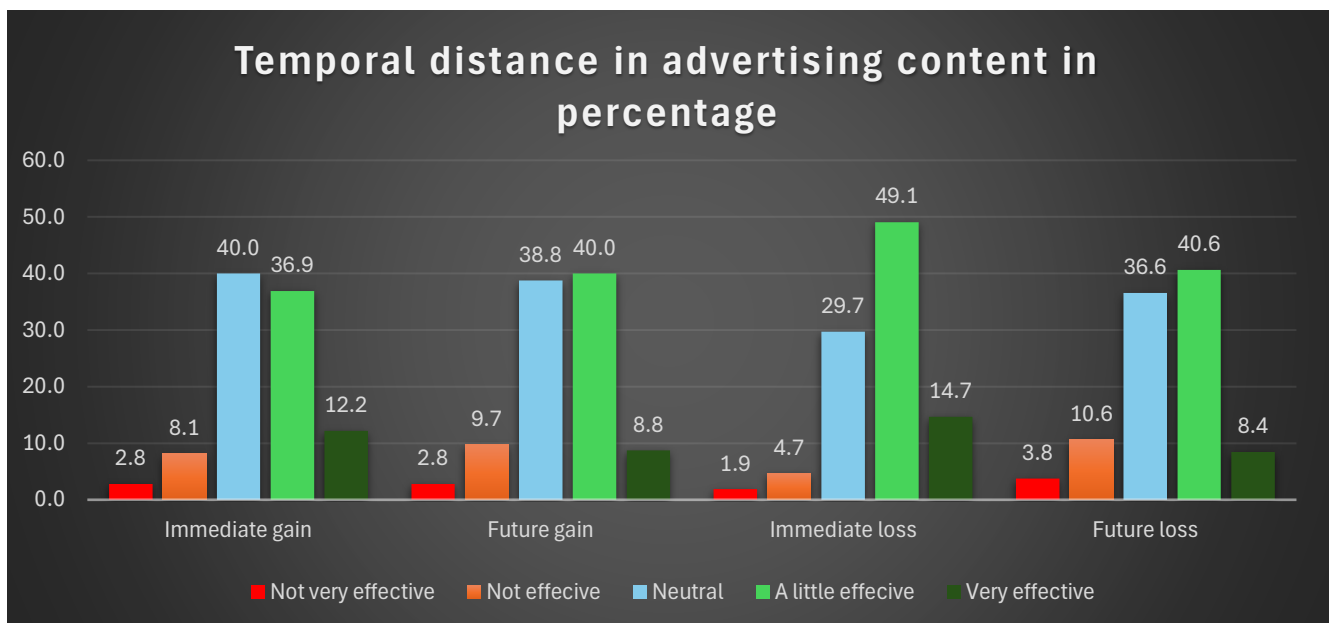


It was revealed that most ACT driver participants preferred to see family (49.4%) as passengers in an ideal road safety advertisement, followed by kids (25.90%).

Figures 25: Preferred passenger in ad

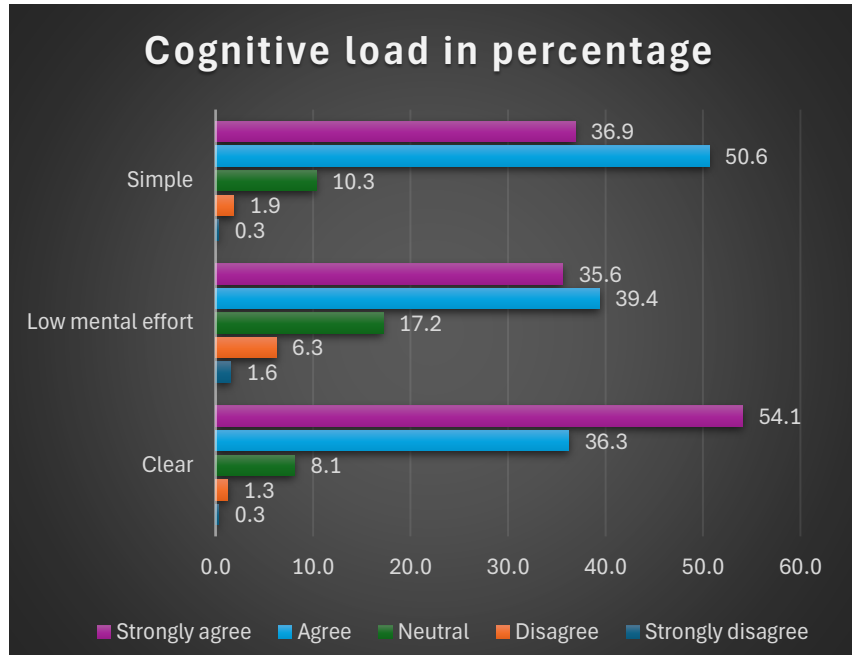
When asked about the ideal road safety message in an advertisement, most participants indicated that they liked a combination of pictorial and audio format (63.10%), followed by a combination of pictorial and text format (17.80%).

In response to the type of distraction shown in road safety advertisements, interestingly, most ACT driver participants preferred to see behavioural-related distractions (41.90%), followed by visual-related distractions (33.80%). Cognitive (11.90%) and auditory (12.50%)-related distractions were less preferred. An interesting question was asked about what kind of temporal distance (time lapse) participants liked to see in road safety advertisements. The four options were: (a) immediate gain (e.g., no car crash now); (b) immediate loss (e.g., a speeding ticket now); (c) future gain (e.g., life continues as usual tomorrow); and (d) future loss (e.g., a speeding ticket in the mailbox in the near future). Findings showed that most participants preferred to see immediate loss (63.80% reported this as either 'effective' or 'very effective') compared to the other options in the advertising content.



Figures 26: Temporal distance

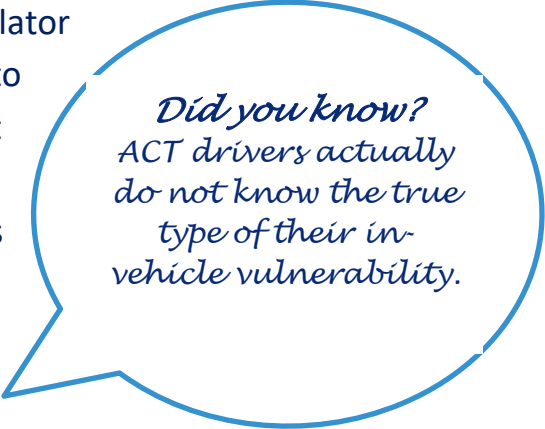
- In terms of cognitive load, it was found that participants preferred to see a road safety advertisement that had a clear message (94.40%), followed by an advertisement focusing on a simple message (87.50%).



Figures 27: Cognitive load

- When participants were asked what distracted them more, all four types of distraction appeared in their responses. The following interesting responses were also provided:
 - *“Seeing someone in the vehicle doing something that I don't think they should be doing, or [that is] is dangerous to themselves or others in the vehicle.”*
 - *“Understanding directions from Google Maps”*
 - *“Visual if a passenger comments on something outside the vehicle”.*
 - *“Most [late] model cars have so many technical features that [they] can be complex to operate. Consequently they can be very distracting when trying to operate them while driving”.*
 - *“Birds or animals coming onto the road”.*
 - *“Changing radio stations when tired from a long drive”.*
- Finally, participants provided some interesting responses to show how they protected themselves from driving distractions, such as focusing on the road, staying alert, concentrating, etc. However, some discrepancies need to be highlighted:

- In considering findings from the driving simulator lab-based experimental study, it is essential to note that participants often did not understand their true type of vulnerability and thus, the strategies they took as precautions may not be effective at times of danger.



*Did you know?
ACT drivers actually
do not know the true
type of their in-
vehicle vulnerability.*

- No ONE single technique worked for everyone. For instance, some participants reported that to stay focused, they turned on the music; however, other participants mentioned they turned off the music to concentrate on the road.
- No consistency was found between what participants said about their vulnerability type and the strategies they took to avoid distractions. For example, one participant reported 'visual' as their main type of vulnerability, but the same participant mentioned that he/she turned off the music as a strategy to stay focused.

A few interesting points

Based on the findings from all studies, a few interesting key points emerged:

- Not all senior drivers are vulnerable. Different types of driving vulnerability may affect younger drivers more than older drivers. The research found that a 87-year-old woman could drive as effectively as an individual aged 67 years.
- ACT drivers do not know the true type of their in-vehicle vulnerability. This meant that the precautions they took for driving distractions may not work when they are driving. For instance, a driver who thinks his type of vulnerability is auditory may silence his mobile phone but, in reality, he may be cognitively vulnerable. Thus, his overthinking while driving continues to pose considerable possible driving danger.

- Women and men do not perceive advertisements in the same way. Women prefer to see a 'flow' in road safety advertisements while men prefer to see in-depth details.

- Women are more likely than men to become involved in risky driving when they develop a risk-taking attitude. This means that the link between attitude and intention to become involved in risky driving is stronger for women, whereas men may develop an risk-taking attitude but, in reality, may not become involved in risky driving at all or may delay their involvement in risky driving.

Recommendations based on Survey 2 results for future social awareness campaigns

- In terms of media usage, the two separate surveys revealed that television, radio and social media were the media most preferred and used by ACT drivers. Thus, future promotional campaigns may consider these forms of media for communicating with ACT drivers.
- In both the eye-tracking study and Survey 2, participants preferred to see male drivers in advertisements rather than female drivers. Participants' motivation behind this perception was not clear (as it was an unexpected finding); however, using a male driver in road safety advertisements would appear to bring more credibility and heighten awareness.
- Future promotional messages should emphasize not only on behavioral/physical and auditory distractions but also cognitive distraction which often receives less attention in road safety campaigns despite its potential risks. The results of Survey 1 indicate that ACT drivers were most frequently distracted by behavioral/physical (29.4%) and auditory (28.2%) distractions. However, the findings also reveal that one in four drivers (24.8%) experience cognitive distraction, particularly when driving alone.

This occurs because individuals tend to become absorbed in thoughts about past or future events, diverting their attention from the driving task. Unlike other distractions that may be more visible or immediately apparent, cognitive distraction can be more challenging to recognize, making it a critical yet often overlooked factor in road safety. Given that the majority of participants were over 40 years old and primarily drive alone and there might be the likelihood of cognitive distraction affecting their driving performance, ACT road safety campaigns should incorporate awareness strategies specifically targeting cognitive distraction tailored to solo drivers, who may be more prone to such distractions.

- Most participants preferred to see negative outcomes in road safety advertisements with suggestion-focused messages. Thus, future promotions should highlight negative outcomes, such as a speeding fine, a life lost, etc. with a suggestion message (e.g., don't drink and drive). Also, most participants preferred to see 'immediate loss' in road safety advertisements rather than 'immediate gain' or 'future gain/loss'. Therefore, showing immediate loss, such as a speeding fine immediately after speeding, etc. would have more impact on the audience.
- As participants mostly preferred to see family members as passengers in road safety advertisements, future advertising should portray characters such as kids and partners in the vehicle. Findings also supported using multi-actor advertisements.
- Emotional and behavioral messages were found to be the most influential, particularly when conveyed through pictorial and auditory formats in future advertisements. However, there must be a right balance of emotional intensity of the message, as excessive emotional content may cause viewers to overlook the core safety message of the ad, as evidenced by the eye-tracking study.

- Ad–self congruency was found to be significant, emphasizing the importance of tailoring road safety campaigns to the specific demographics of the target audience. To maximize effectiveness, advertising content, characters, and scenarios should align with the profile of the intended viewers, ensuring familiarity and relevance. Given that the majority of our participants were parents, they preferred to see children and family featured in road safety ads, as these elements resonate with their personal experiences and concerns. However, they also favored seeing male drivers depicted as a source of reliability, suggesting that the portrayal of certain roles and characteristics can influence how the message is received and trusted.
- With individuals often failing to identify their true vulnerability type, it would be a good initiative in future road safety advertisements to increase awareness that everyone has dissimilar types of vulnerability. Thus, individuals should be aware that they need to spend time determining their own vulnerability type to protect themselves from potential danger when driving.

Directions for future research

Crucial areas that could be investigated by future research efforts include:

- Outside distractions, such as pedestrians' inattentiveness, other vehicle drivers' mistakes, bad weather, etc. also have equal levels of impact on drivers' decision making and capability to drive safely. It would be of interest in future research to investigate the main psychological causes of outside distractions and ways in which they can be prevented.

- Further investigation of ACT drivers is needed to reveal their true vulnerability type. Without knowing what most distracts them from driving safely, taking precautions or delivering road safety messages will not be optimally effective.

In addition, vulnerability is not static; it can evolve over the course of a person's life due to declining physical or mental abilities. Additionally, the type of vulnerability

may be influenced by recent incidents, stress levels, emotional states, and other situational factors. Therefore, future research could focus on exploring how these dynamic factors contribute to changes in vulnerability type over time.

- Future research could identify the ACT road hot spots (those with the highest accident rate in previous years) and provide an innovative geo-psychological solution that would reduce or prevent crashes in these spots. For instance, Canberra Avenue in Fyshwick has the highest rate of accidents in the ACT, as mentioned by the insurance company, AAMI (<canberradaily.com>).

- Investigating visual impacts at the side of roads would be of interest for future research. For instance, leaving a car door from a crashed vehicle at the roadside could give an immediate visual warning to drivers when passing that spot and it may work better than roadside billboards with safety messages.

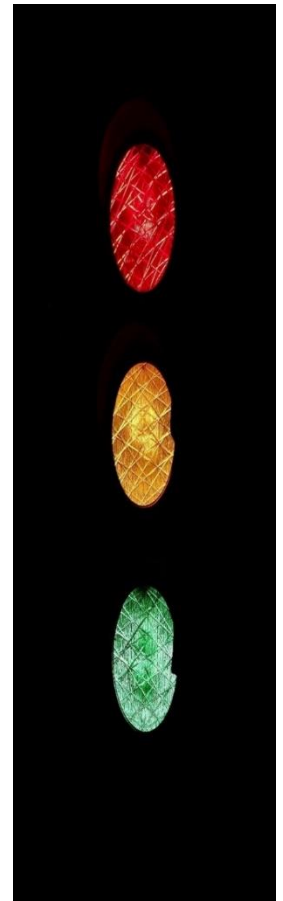
- Investigating whether sharing local information with road users about crashes, outcomes of crashes, reasons for crashes, etc. via social media or other traditional media would increase road safety awareness among local drivers.



* All the images except the researchers' own photographs were taken from the copyright-free website <www.pexels.com>.

References

- Amini, R. E., Al Haddad, C., Batabyal, D., Gkena, I., De Vos, B., Cuenen, A., ... & Antoniou, C. (2023). Driver distraction and in-vehicle interventions: A driving simulator study on visual attention and driving performance. *Accident Analysis & Prevention*, *191*, 107195.
- Australian Automobile Association, 2022. www.aaa.asn.au, Retrieved on 29 October 2024.
- Canberra Daily (n.d.), www.canberradaily.com
- Chang, C. (2005). The moderating influence of ad framing for ad-self-congruency effects. *Psychology & Marketing*, *22*, 955–968.
- Castillo-Manzano, J. I., Castro-Nuño, M. and Pedregal, D. J. (2012), “How many lives can bloody and shocking road safety advertising save? The case of Spain”, *Transport Research: Part F Traffic Psychology Behaviour*, *15*(2), 174-187.
- Fatima, J. K. (2023). Does it matter to have rapport and social interaction on a group tour? *Journal of Vacation Marketing*.
- Green, M. C., & Brock, T. C. (2000). The role of transportation in the persuasiveness of public narratives. *Journal of Personality and Social Psychology*, *79*(5):701–721.
- Hamido, S., Hamamoto, R., Gu, X., & Itoh, K. (2021). Factors influencing occupational truck driver safety in ageing society. *Accident Analysis & Prevention*, *150*, 105922.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2016). Testing measurement invariance of composites using partial least squares. *International Marketing Review*, *33*(3), 405-431.
- Judd, T., Ehinger, K., Durand, F. & Torralba, A. (2009). Learning to predict where humans look. *International Conference on Computer Vision (ICCV)*.
- Karl, M., Sie, L., & Ritchie, B. W. (2022). Expanding travel constraint negotiation theory: An exploration of cognitive and behavioral constraint negotiation relationships. *Journal of Travel Research*, *61*(4), 762-785.
- Leppink, J., Paas, F., Van der Vleuten, C. P. M., Van Gog, T., & Van Merriënboer, J. J. G. (2013). Development of an instrument for measuring different types of cognitive load. *Behavior Research Methods*, *45*(4), 1058–1072.
- MacDonald P. (2024) Road safety campaigns that hit hard. Retrieved on 4 January 2025. www.murphys-law.com.au
- Myers, S. D., Deitz, G. D., Huhmann, B. A., Jha, S., & Tatar, J. H. (2020). An eye-tracking study of attention to brand-identifying content and recall of taboo advertising. *Journal of Business Research*, *111*: 176-186.
- Road Safety Program (2024) Retrieved on 4 January 2025. www.transport.nsw.gov.au/
- Sirgy, M. J., & Su, C. (2000). Destination image, self-congruity, and travel behavior: Toward an integrative model. *Journal of Travel Research*, *38*(4), 340–352.
- Subramanian R., Katti, H., Sebe, N., Kankanhalli, M., & Chua, T. S. (2010) An eye fixation database for saliency detection in images. In: Daniilidis, K., Maragos, P., Paragios, N. (eds) *Computer Vision – European Conference on Computer Vision (ECCV)*.
- Subramanian R., Shankar, D., Sebe N., & Melcher D. (2014). Emotion modulates eye movement patterns and subsequent memory for the gist and details of movie scenes. *Journal of Vision*, *14*(3):31.
- White, K., MacDonnell, R., & Dahl, D. W. (2011). It's the mind-set that matters: The role of construal level and message framing in influencing consumer efficacy and conservation behaviors. *Journal of Marketing Research*, *48*(3), 472–485.
- Yan, Y., Zhong, S., Tian, J., & Song, L. (2022). Driving distraction at night: The impact of cell phone use on driving behaviors among young drivers. *Transportation research part F: traffic psychology and behaviour*, *91*, 401-413.
- Zhang, J. D., Li, J., & Shan, Z. (2020) Implementation of Dlib deep learning face recognition technology. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Sanya, China. (pp. 88-91).
- van Dijken, J. H., Veldstra, J. L., van de Loo, A. J., Verster, J. C., van der Sluiszen, N. N. J. J. M., Vermeeren, A., ... & de Waard, D. (2020). The influence of alcohol (0.5‰) on the control and manoeuvring level of driving behaviour, finding measures to assess driving impairment: A simulator study. *Transportation research part F: traffic psychology and behaviour*, *73*, 119-127.



Appendix I: Survey 1 additional insights

Type of licence (Q. 17 in survey 1 questionnaire)

Licence type	Frequency	Percent
L permit	1	.2%
Red P (provisional)	1	.2%
Full licence	507	99.6%
Total	509	100.0%

Type of driver (Q. 18 in survey 1 questionnaire)

	Frequency	Percent
Residential/non-commercial	502	98.6%
Business (van, truck, etc.)	2	.4%
Commercial (taxi/Uber, etc.)	5	1.0%
Total	509	100.0%

Involvement in accidents in past five years (Q. 25 in survey 1 questionnaire)

	Frequency	Percent
Yes, in a major way (physical injury or major car damage)	8	1.6%
Yes, in a minor way (minor car damage, no or minor physical injury)	67	13.2%
No	434	85.3%
Total	509	100.0%

Cause of the accident if select 'yes' in previous question (Q. 26 in survey 1 questionnaire)

	Frequency	Percent
External cause (e.g., other driver's mistake, pedestrian's mistake, road condition, collision with kangaroo [or other animal])	67	13.2%
Inside vehicle cause (e.g., using mobile phone, adjusting media, talking to passengers, distracted by children, deep thinking)	8	1.6%
Total	75	14.7%

Speeding tickets received or not (Q. 27 in survey 1 questionnaire)

	Frequency	Percent
Yes	86	16.9%
No	423	83.1%
Total	509	100.0

If speeding tickets received, how many (Q. 27A in survey 1 questionnaire)

No. of tickets	Frequency	Percent
1	65	12.8%
2	15	2.9%
3	3	.6%
4	1	.2%
5	2	.4%
Total	86	16.9

What do you think most about when driving alone (Q. 28 in survey 1 questionnaire)

	Frequency	Percent
Future plans	28	5.5%
Recent days' regular incidents (family-related or work-related)	69	13.6%
Trauma/stress-related incident that happened in the past or that is currently happening	4	.8%
I do not think about anything in particular	365	71.7%
Others	43	8.4%
Total	509	100.0

What is the sound level or source in your car most of the time (Q. 29 in survey 1 questionnaire)

	Frequency	Percent
Loud music	23	4.5%
Quiet/soft music	121	23.8%
Radio	272	53.4%
I do not play music	49	9.6%
Conversation with or between passengers	18	3.5%
Others	26	5.1%
Total	509	100.0

How do you use your mobile phone when driving? (Q. 30 in survey 1 questionnaire)

	Frequency	Percent
Hand-held mobile	3	.6%
Mobile in a holder in the car with loudspeaker	46	9.0%
Bluetooth	276	54.2%
Only when I've pulled over and parked on the side of the road	66	13.0%
I do not use my mobile phone in the car at all	118	23.2%
Total	509	100.0

If describing yourself as a risk-taker, which one of the following descriptions would apply to you (Q. 33 in survey 1 questionnaire)

	Frequency	Percent
Over-concerned or conservative driver (e.g., usually drives slower than the speed limit, indicates...	76	14.9%
Standard risk-taker (e.g., usually drives within the speed limit, indicates within the normal distance...	407	80.0%
Slightly higher risk-taker (e.g., drives about 5 km/hr more than the speed limit, often fails to indicate...	24	4.7%
High risk-taker (e.g., drives more than 5 km/hr above the speed limit, usually does not indicate...	2	.4%
Total	509	100.0

Additional analysis from Survey 1

Crosstabulation analysis (Q4, Gender and Q32 type of in-vehicle distraction)

Gender		Type of distraction				Total
		Auditory distraction (e.g., music, radio, children shouting or crying, listening to passenger/s, listening to partner, etc.)	Behavioural distraction (e.g., adjusting media or air conditioning/heating, texting, talking or arguing with partner...	Visual distraction (e.g., looking at Navigator PRO [or similar], looking at partner or children, looking at mobile...	Cognitive distraction (e.g., about past events, current problems, future plans, etc.)	
Female	Count	68	61	32	57	218
	% within Q4. Gender	31.2%	28.0%	14.7%	26.1%	100.0%
Male	Count	72	86	61	71	290
	% within Q4. Gender	24.8%	29.7%	21.0%	24.5%	100.0%
Prefer not to say	Count	1	0	0	0	1
	% within Q4. Gender	100.0%	0.0%	0.0%	0.0%	100.0%
Total	Count	141	147	93	128	509
	% within Q4. Gender	27.7%	28.9%	18.3%	25.1%	100.0%

* Key finding: Females are more likely to be distracted by auditory whereas males are more vulnerable to visual distraction. The other two types of distractions seem like affecting in a similar fashion to both genders.

Crosstabulation analysis (Q20. Parent or not Q4, Gender and Q32 type of in-vehicle distraction)

Parent or not			Auditory distraction	Behavioural distraction	Visual distraction	Cognitive distraction	Total	
			Have children?	Yes	Count	97		100
		% within Q20. Have children?	28.8%	29.7%	16.9%	24.6%	100.0%	
	No	Count	44	47	36	45	172	
		% within Q20. Have children?	25.6%	27.3%	20.9%	26.2%	100.0%	
Total			Count	141	147	93	128	509
			% within Q20. Have children?	27.7%	28.9%	18.3%	25.1%	100.0%

* Key finding: For parents, behavioural and auditory distractions are the highest in vehicle distractions followed by cognitive distraction and then visual distraction. Visual distraction is also recorded as the lowest form of in vehicle distraction for non-parent drivers (20.9%) and behavioural (27.3%), the highest form of distraction. Auditory distraction was slightly lower for non-parent drivers (25.6%) and cognitive distraction slightly higher (26.20%).

Appendix II: Survey 1 questionnaire

Q1: Age

What is your age group? *Please choose appropriate answer.*

- a. Under 18yrs – [TERMINATE]
- b. 18–24yrs
- c. 25–40yrs
- d. 41–55yrs
- e. 56–70yrs
- f. 70yrs+

Q2: Length of driving

How long have you been driving? *Please choose appropriate answer.*

- a. 1–2 years
- b. 3–6 years
- c. 7–12 years
- d. 13–20 years
- e. 21+ years
- f. I do not drive – [TERMINATE]

Q3: Australian Capital Territory (ACT) roads

Have you driven on ACT roads within the past two years? *Please choose appropriate answer.*

- a. Yes
- b. No – [TERMINATE]

Q4: Gender

Please indicate your gender. *Please choose appropriate answer.*

- a. Female
- b. Male
- c. Other
- d. Prefer not to say

Q5: Residential location

What is your current residential postcode? Postcode:

Q6: Risk-taking attitude

[5-point scale – rotating grid]

For the following statements, please answer from 1–5 (1=strongly disagree and 5=strongly agree).

- I think it is a good idea to take risks while driving.
- I feel comfortable taking risks while driving.
- I find it fun to take risks while driving.

Q7: Perceived behavioural control

[5-point scale - rotating grid]

For the following statements, please answer from 1–5 (1=strongly disagree and 5=strongly agree).

- I am so confident in my driving skills that I can take risks when driving.
- It is entirely up to me to estimate the risks when driving.
- I have complete control over taking risks when driving.

Q8: Intention to be involved in risky behaviour when driving

[5-point scale - rotating grid]

For the following statements, please answer from 1–5 (1=strongly disagree and 5=strongly agree).

- I plan to be involved in risky driving behaviour (e.g., being distracted) in the future.
- I am willing to be involved in risky driving behaviour (e.g., being distracted) in the future.
- I intend to be involved in risky driving behaviour (e.g., being distracted) in the future.

Q9: Perceived spatial and temporal distances

[Grid format] *For the following statements, please mark an answer in the columns from 1–5.*

Spatial distance	1 Never	2 Unlikely	3 Neutral	4 Likely	5 Always
When driving, it is difficult for me to quickly refocus on the road					
... if I look at something inside the car (e.g., Navigator PRO [or similar], children, mobile phone, etc.).					
... if I hear something loud inside the car (e.g., fast-paced music, baby crying, passenger conversation, children shouting, etc.).					
... if I'm thinking about something deeply (e.g., job-related or family-related incidents, current problems,					

future plans, something urgent that I need to do, like answering a call, etc.).					
... if I'm doing something inside the car (e.g., adjusting the mirror, eating or drinking, talking, texting, adjusting the sound system, etc.).					
Temporal distance	1 Never	2 Unlikely	3 Neutral	4 Likely	5 Always
When driving, I struggle to calculate the distance by time (i.e., the 3-second distance rule) between my car and the car in front of me					
... if I look at something inside the car (e.g., Navigator PRO [or similar], children, mobile phone, etc.).					
... if I hear something loud inside the car (e.g., fast-paced music, baby crying, passenger conversation, children shouting, etc.).					
... if I'm thinking about something deeply (e.g., job related or family-related incidents, current problems, future plans, something urgent that I need to do, like answering a call, etc.).					
... if I'm doing something inside the car (e.g., adjusting the mirror, eating or drinking, talking, texting, adjusting the sound system, etc.).					

Q10: Injunctive subjective norm

[5-point scale - rotating grid]

For the following statements, please answer from 1–5 (1=strongly disagree and 5=strongly agree).

- Passengers in my car (family, friends, or customers [for commercial drivers]) will agree that I should take risks when driving.
- Passengers in my car (family, friends or customers [for commercial drivers]), whose opinions I value, would approve of my decision to take risks when driving.
- Passengers in my car (family, friends or customers [for commercial drivers]) will agree that I should violate traffic rules sometimes when driving.

Q11: Descriptive norm

[5-point scale - rotating grid]

For the following statements, please answer from 1–5 (1=strongly disagree and 5=strongly agree).

- Most passengers in my car (family, friends or customers [for commercial drivers]) would take risks when driving.
- Most passengers in my car (family, friends or customers [for commercial drivers]) would violate traffic rules sometimes when driving.
- Other drivers on the road take risks when driving.

Q12: Self-regulation

[5-point scale - rotating grid]

For the following statements, please answer from 1–5 (1=strongly disagree and 5=strongly agree).

- I am able to resist temptation when driving.
- I don't get easily distracted when driving.
- I don't care if I'm different from most of the other drivers on the road.

Q13: Rapport

[5-point scale - rotating grid]

For the following statements, please answer from 1–5 (1=strongly disagree and 5=strongly agree).

Thinking about your car passenger/s, in general:

- I am comfortable interacting with my car passenger/s.
- My car passenger/s relates/relate well to me.
- I enjoy interacting with my car passenger/s.
- I strongly care about my car passenger/s.
- My car passenger/s has/have taken a personal interest in me.
- I have a close relationship with my car passenger/s.

Q14: Risk perception

[5-point scale - rotating grid]

For the following statements, please answer from 1–5 (1=strongly disagree and 5=strongly agree).

- It is safe to take risks when driving because it makes driving more fun.
- It is safe to interact with others (i.e., my passengers) when driving.
- It is safe to drive faster than other drivers around me.
- I am not concerned that my car will be in an accident when I'm driving.
- I am not worried about injuries to me from traffic accidents when I'm driving.

Q15: Optimism bias

[5-point scale - rotating grid]

For the following statements, please answer from 1–5 (1=strongly disagree and 5=strongly agree).

- Compared to other drivers, I would say that the risk of my car being in an accident is very low.
- Traffic accidents are more likely to happen to other drivers than to me.
- Compared to other drivers, I would say that the risk of my car being in an accident in bad weather is very low.
- Compared to other drivers, I would say that my risk of being in an accident when I drive while tired is very low.

Q16: Ethnic background

What is your ethnicity?

- 1 Oceanian (e.g., Australian, Indigenous Australian, New Zealander, Pacific Islander, etc.)
- 2 North-Western European (e.g., British, Irish, German, Scandinavian, etc.)
- 3 Southern and Eastern European (e.g., Italian, Greek, Polish, etc.)
- 4 North African and Middle Eastern (e.g., Arab, Sudanese, Egyptian, etc.)
- 5 South-East Asian (e.g., Indonesian, Malaysian, Singaporean, Filipino, etc.)
- 6 North-East Asian (e.g., Chinese, Japanese, etc.)
- 7 Southern and Central Asian (e.g., Bangladeshi, Indian, Pakistani, etc.)
- 8 Peoples of the Americas (e.g., North American, Mexican, etc.)
- 9 Sub-Saharan African (e.g., Somali, Namibian, South African, etc.)
- 10 Other (please specify):
- 11 Prefer not to say

Q17: Licence type

What type of licence do you hold? *Please choose appropriate answer.*

- a. L permit
- b. Red P (provisional)
- c. Green P (provisional)
- d. Full licence
- e. Overseas licence

Q18: Driver type

Most of the time, what type of driver are you? *Please choose appropriate answer.*

- a. Residential/non-commercial
- b. Business (van, truck, etc.)
- c. Commercial (taxi/Uber, etc.)

Q19: Driving location

Where do you drive most of the time? *Please choose appropriate answer.*

- a. Urban areas
- b. Rural areas
- c. Mix of urban and rural areas.

Q20: Children (I)

Do you have children? *Please choose appropriate answer.*

- a. Yes
- b. No

Q21: Children (II)

[ONLY ASK THOSE WHO ANSWER 'YES' TO Q20]

How many children do you have? What age/s are your children?

No. of children:

Age of each child:

Q22: Passengers

Who travels in the car with you most often when you are driving? *Please choose all that apply.*

- a. Partner
- b. Friends
- c. Co-worker/s
- d. Alone
- e. Extended family members
- f. Children (aged from 0–2 years)
- g. Children (aged from 3–6 years)
- h. Children (aged from 7*–12 years) *Children aged from 7 years may sit in the front seat.
- i. Children (aged from 13–17 years)
- j. Adult children
- k. Customers [Uber driver, taxi driver, etc.]
- l. Others not listed here (please specify):

Q23: Driving time

What time do you usually drive in your regular working week? *Please choose all that apply.*

- a. Between 7.00 am and 9.30am
- b. Between 9.31 am and 2.00pm
- c. Between 2.01 pm and 3.30pm
- d. Between 3.31 pm and 5.00pm
- e. Between 5.01 pm and 7.00pm
- f. Between 7.01 pm and 10.00pm
- g. Between 10.01pm and 6.59am

Q24: Driving hours

How many hours do you usually drive per day in your working week (e.g., between Monday and Friday, or other, such as weekend work, shift work, etc.)? *Please choose appropriate answer.*

- a. 1–2 hours per day
- b 3–5 hours per day
- c. More than 5 hours per day

Q25: Accidents (I)

Have you been involved in any accidents in the past five years? *Please choose appropriate answer.*

- a. Yes, in a major way (physical injury or major car damage)
- b. Yes, in a minor way (minor car damage, no or minor physical injury)
- c. No

Q26: Accidents (II)

[ONLY ASK THOSE WHO ANSWERED YES TO Q25]

What was the cause of the accident you experienced? *Please select appropriate answer.*

- a. External cause (e.g., other driver's mistake, pedestrian's mistake, road condition, collision with kangaroo [or other animal], bad weather, etc.)
- b. Inside vehicle cause (e.g., using mobile phone, adjusting media, talking to passengers, distracted by children, deep thinking, etc.)

Q27: Speeding

Have you received any speeding tickets in the past five years? (do not include parking tickets) *Please select appropriate answer.*

- a. Yes
- b. No
- C. If yes, how many speeding tickets?

Q28: Driving alone

What do you think most about when driving alone? *Please select the appropriate answer.*

- a. Future plans
- b. Recent days' regular incidents (family-related or work-related)
- c. Trauma/stress-related incident that happened in the past or that is currently happening
- d. I do not think about anything in particular.
- e. Other (please specify):

Q29: Sound level or source in car

What is the sound level or source in your car most of the time? *Please select the appropriate answer.*

- a. Loud music
- b. Quiet/soft music
- c. Radio
- c. I do not play music
- d. Sound of children's iPad/phone game
- e. Conversation with or between passengers
- f. Other (please specify):

Q30: Mobile phone (I)

How do you use your mobile phone when driving? *Please select the appropriate answer.*

- a. Hand-held mobile
- b. Mobile in a holder in the car with loudspeaker
- c. Bluetooth
- d. Only when I've pulled over and parked on the side of the road.
- e. I do not use my mobile phone in the car at all.

Q31: Mobile phone (II)

[ONLY ASK THOSE WHO ANSWERED A, B OR C IN Q30]

What do you mostly use your mobile phone for while driving? *Please select all that apply.*

- a. Talking
- b. Texting
- c. Watching Navigator PRO (or similar)
- d. Watching social media, video, etc.

Q32: Distractions

What is the most frequent distraction inside your car that causes you problems when you drive?
Please choose the appropriate answer.

- a. Listening (e.g., music, radio, children shouting or crying, listening to passenger/s, listening to partner, etc.)
- b. Doing something (e.g., adjusting media or air conditioning/heating, texting, talking or arguing with partner, adjusting mirrors, drinking or eating, etc.)
- c. Seeing something (e.g., looking at Navigator PRO [or similar], looking at partner or children, looking at mobile phone, looking at billboards or advertising signage, etc.)
- d. Thinking (e.g., about past events, current problems, future plans, etc.).

Q33: Risk-taker

If describing yourself as a risk-taker, which one of the following descriptions would apply to you?
Please choose the appropriate answer.

- a. Over-concerned or conservative driver (e.g., usually drives slower than the speed limit, indicates well before turning, changing lane or merging, usually doesn't overtake, etc.).
- b. Standard risk-taker (e.g., usually drives within the speed limit, indicates within the normal distance before turning, changing lane or merging, sometimes overtakes, etc.).
- c. Slightly higher risk-taker (e.g., drives about 5 km/hr more than the speed limit, often fails to indicate when turning, changing lane or merging, becomes impatient when the car in front is travelling slower than the speed limit, meaning that you would overtake with risk, etc.).
- d. High risk-taker (e.g., drives more than 5 km/hr above the speed limit, usually does not indicate, changes lane with risk to save time even when car in front is driving at the speed limit, shows other drivers how to have fun when driving, thinks other drivers are often not brave enough to take risks, etc.).

Appendix III: Driving simulator self-reported questionnaire additional insights

Age distribution

Age	Frequency	Percent
16 to 22 years	14	11.7
23 to 35 years	43	35.8
36 to 45 years	26	21.7
46 to 60 years	22	18.3
61 to 90 years	15	12.5
Total	120	100.0

Gender distribution

	Frequency	Percent
Female	61	50.8
Male	59	49.2
Total	120	100.0

Type of licence

	Frequency	Percent
L	2	1.7
Red P	2	1.7
Green P	7	5.8
Full licence	94	78.3
Overseas licence	14	11.7
Total	119	99.2
Missing (didn't answer)	1	.8
Total	120	100.0

Length of driving

	Frequency	Percent
1 to 5 years	30	25.0
6 to 10 years	20	16.7
11 to 15 years	11	9.2
16 to 20 years	14	11.7
21 to 30 years	15	12.5
31 to 50 years	23	19.2
51 to 80 years	5	4.2
Total	118	98.3
Missing (Didn't answer)	2	1.7
Total	120	100.0

Ethnicity distribution is not suitable for reporting considering most of the participants came from many different countries. However, the major countries participants mentioned are: Australian, Chinese, Indian, Bhutanese, Vietnamese, Pakistani, African, Caucasian

Appendix IV: Driving simulator questionnaire

How long have you been driving (either in Australia or overseas):years approx.

What is your current licence type: Learner/Red P/Green P/Full licence/Overseas licence

What is your major ethnicity (not citizenship, e.g., Bangladeshi):.....

Calculation of space-related distance after distraction by research team member

After any disturbance by the research team member while you were driving in the simulator, did you struggle to calculate the distance by space (i.e. where to stop the car, where to give way, where to drive, etc.).

Highly disagree Disagree Somewhat disagree agree Agree
Highly Agree

Calculation of time-related distance after distraction by research team member

After any disturbance by the research team member while you were driving in the simulator, did you struggle to calculate the distance by time (i.e., 3-second distance rule, time needed to brake before stop sign, time needed to brake before pedestrians, with your car speed, object in front of you)?

Highly disagree Disagree Somewhat disagree agree Agree
Highly Agree

How much was the driving simulator representative of real-life driving in your opinion?

Put one X on your best opinion below, 1=least representative, 10=highly representative

1.... 2.... 3.... 4.... 5.... 6.... 7.... 8.... 9.... 10....

Tick appropriate option [5-point scale: 1=strongly disagree, 5=strongly agree]

Risk taking attitude

- I think it is a good idea to take risks while driving.

Highly disagree Disagree Somewhat disagree agree Agree
Highly Agree

- I feel comfortable taking risks while driving.

Highly Agree Highly Agree disagree Disagree Somewhat agree Agree

- I find it fun to take risks while driving.

Highly Agree Highly Agree disagree Disagree Somewhat agree Agree

Intention to do risky driving

- I plan to be involved in risky driving behaviour in the future.

Highly Agree Highly Agree disagree Disagree Somewhat agree

- I am willing to be involved in risky driving behaviour in the future.

Highly Agree Highly Agree disagree Disagree Somewhat agree

- I intend to be involved in risky driving behaviour in the future.

Highly Agree Highly Agree disagree Disagree Somewhat agree

Attitude toward in-car rapport (rapport in this study means: positive talking, laughing and looking at your car passenger when you are driving)

- I think it is a good idea to comfortably interact with my car passenger/s while driving.

Agree Highly Agree Highly Agree disagree Disagree Somewhat agree

- It is fun to have an enjoyable interaction with my car passenger/s while driving.

Highly Agree disagree Highly Agree Disagree Somewhat agree

- I feel comfortable to strongly care about my car passenger/s while driving.

Highly Agree disagree Highly Agree Disagree Somewhat agree

- I like to take a personal interest in my passenger/s while driving.

Highly Agree disagree Highly Agree Disagree Somewhat agree

Appendix V: Eye-tracking questionnaire

Which type of media do you usually use to see or hear advertising in your regular daily life (either while driving or at home, park, work, etc.)?

(Tick or write the most frequent one):

Television/Radio/Social media or Others (write).....

Tick appropriate option [5 point scale: 1=Strongly disagree, 5=Strongly agree]

A. Intention toward inside-car rapport (rapport in this study means: positive talking, laughing and looking at your car passenger when you are driving)

I plan to be involved in inside-car rapport while driving in the future.

Highly disagree Disagree Somewhat agree
Agree Highly Agree

- I am willing to be involved in inside-car rapport while driving in the future.

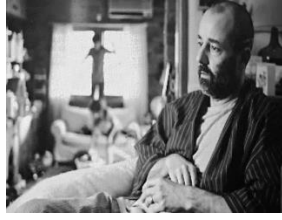
Highly disagree Disagree Somewhat agree
Agree Highly Agree

- I intend to be involved in inside-car rapport in the future.

Highly disagree Disagree Somewhat agree
Agree Highly Agree

B. Attitude toward advertising

Which advertising you think is the most effective one? Put X straight down to the ad.



Keeping the ad you identified above, rate this ad with the following statements.

- It was a good road safety advertising.

Highly disagree Disagree Somewhat disagree
Neutral

Somewhat agree Agree Highly agree

- The advertising was pleasant for road safety campaign.

Highly disagree Disagree Somewhat disagree
Neutral

Somewhat agree Agree Highly agree

- My attitude toward this ad is favourable for road safety campaign.

Highly disagree Disagree Somewhat disagree
Neutral

Somewhat agree Agree Highly agree

C. Intention to adopt cautionary advice of the advertising.

- I plan to adopt cautionary advice of the road safety advertising in the future.

Highly disagree Disagree Somewhat agree
Agree Highly Agree

- I am willing to take cautionary advice of the road safety advertising in the future.

Highly disagree Disagree Somewhat agree
Agree Highly Agree

- I intend to follow cautionary advice of the road safety advertising in the future.

Highly disagree Disagree Somewhat agree
Agree Highly Agree

Appendix VI: Survey 2 additional insights

Driving length (Q.2 in survey 2 questionnaire)

	Frequency	Percent
1-2 years	1	.3
3-6 years	3	.9
7-12 years	13	4.1
13-20 years	27	8.4
More than 20 years	276	86.3
Total	320	100.0

Ethnicity (Q.8 in survey 2 questionnaire)

	Frequency	Percent
Australian or Oceanian	213	66.6
North Western Europe	61	19.1
East or Southern Europe	14	4.4
South East Asian	9	2.8
North East Asian	5	1.6
Southern or Central Asian	9	2.8
Peoples of the Americas	2	.6
Others	3	.9
Prefer not to say	4	1.3
Total	320	100.0

Type of licence (Q.11 in survey 2 questionnaire)

	Frequency	Percent
Full licence	318	99.4
Provisional licence	2	.6
Total	320	100.0

Additional analysis from Survey 2

Crosstabulation analysis (Q.2 Length of driving and Q.6 type of in-vehicle distraction)

			Type of in-vehicle car distractions				Total	
			Auditory	Behavioural	Visual	Cognitive		
Driving length	1-2 years	Count	0	0	0	1	1	
		% within Driving length	0.0%	0.0%	0.0%	100.0%	100.0%	
	3-6 years	Count	2	0	0	1	3	
		% within Driving length	66.7%	0.0%	0.0%	33.3%	100.0%	
	7-12 years	Count	5	2	2	4	13	
		% within Driving length	38.5%	15.4%	15.4%	30.8%	100.0%	
	13-20 years	Count	6	10	8	3	27	
		% within Driving length	22.2%	37.0%	29.6%	11.1%	100.0%	
	More than 20 years	Count	66	74	45	91	276	
		% within Driving length	23.9%	26.8%	16.3%	33.0%	100.0%	
	Total		Count	79	86	55	100	320
			% within Driving length	24.7%	26.9%	17.2%	31.3%	100.0%

* Key finding: Drivers reported that overall, they are more distracted by all four types of distractions after first six years of their driving. The highest reported count of distractions is found in 'more than 20 years' category, which is probably due to growing drivers' age and declined physical and mental strength. Individuals get highly distracted in particular by behavioural once they become more experienced driver such as 37% in 13-20 years category and 26.8% in more than 20 years of driving category.

Appendix VII: Survey 2 questionnaire

Q1: Age

What is your age group? *Please choose appropriate answer.*

- a. Under 18 yrs – [TERMINATE]
- b. 18–24 yrs
- c. 25–40 yrs
- d. 41–55 yrs
- e. 56–70 yrs
- f. 70 yrs+

Q2: Length of driving

How long have you been driving? *Please choose appropriate answer.*

- a. Less than one year
- b. 1–2 years
- c. 3–6 years
- d. 7–12 years
- e. 13–20 years
- f. 21+ years
- g. I do not drive – [TERMINATE]

Q3: Australian Capital Territory (ACT) roads

Have you driven on ACT roads within the past two years? *Please choose appropriate answer.*

- a. Yes
- b. No – [TERMINATE]

Q4: Gender

Please indicate your gender. *Please choose appropriate answer.*

- a. Female
- b. Male
- c. Other
- d. Prefer not to say

Q5: What type of media do you use/view most of the time in your daily life? *Please choose most appropriate answer.*

- a. Television
- b. YouTube
- c. Social media
- d. Radio
- e. Others (please specify) _____

Q6: Distractions

What distraction inside your car most frequently causes problems when you drive?

Please choose most appropriate answer.

- a. Listening to something (e.g., music, radio, children shouting or crying, listening to passenger/s, listening to partner, etc.)
- b. Doing something (e.g., adjusting media or air conditioning/heating, texting, adjusting mirrors, drinking or eating, etc.)
- c. Looking at something (e.g., looking at Navigator PRO [or similar], looking at partner or children, looking at mobile phone, looking at billboards or advertising signage, etc.)
- d. Thinking about something (e.g., past events, current problems, future plans, etc.)

Q7: Most of the time I drive ...

Please choose most appropriate answer.

- a. By myself/alone
- b. With family members (other than children)
- c. With children
- d. With friends
- e. With co-workers
- f. With clients/customers [including commercial taxi drivers]
- g. With others (please specify) _____

Q8: Ethnic background

What is your ethnicity? *Please choose most appropriate answer.*

- 1. Australian or Oceanian (e.g., Australian, Indigenous Australian New Zealander, Maori, Pacific Islander, etc.)
- 2. North-Western European (e.g., British, Irish, German, Scandinavian, etc.)
- 3. Southern or Eastern European (e.g., Italian, Greek, Polish, etc.)
- 4. North African or Middle Eastern (e.g., Arab, Sudanese, Egyptian, etc.)
- 5. South-East Asian (e.g., Indonesian, Malaysian, Singaporean, Filipino, etc.)
- 6. North-East Asian (e.g., Chinese, Japanese, etc.)
- 7. Southern or Central Asian (e.g., Bangladeshi, Indian, Pakistani, etc.)
- 8. Peoples of the Americas (e.g., North American, Mexican, etc.)
- 9. Sub-Saharan African (e.g., Somali, Namibian, South African, etc.)
- 10. Other (please specify) _____
- 11. Prefer not to say

Q9: Attitude toward road safety advertising showing social interaction between the car driver and passengers

[5-point scale – rotating grid]

For the following statements, on road safety advertising, please answer from 1–5 (1=strongly disagree and 5=strongly agree).

- I think it is a good idea to see the car driver interacting with the passengers.
- I feel positive when I see the car driver interacting with the passengers.
- I like seeing the car driver learning about the passengers through social interaction.

Q10: When you see a road safety advertisement, what type of message draws your attention more? *Please choose the appropriate option.*

Message type	Most unlikely	Unlikely	Neutral	Likely	Most likely
A. 'Emotional' message (e.g., "Drink, drive, die in a ditch")					
B. 'Rational/informative' message (e.g., "Casual speeding, every K counts")					
C. 'Cognitive/thinking'-focused message (e.g., "You won't see it coming")					
D. 'Behaviour'-focused message (e.g., "It's not that important. Don't text and drive")					
E. 'Social interaction'-related message (e.g., "Stop kidding yourself")					
F. 'Story'-based message with positive ending (e.g., "Driving home from shopping centre with kids; an electric scooter crosses the car's path; due to high speed, last-minute hard braking is needed ... and a crash is avoided")					
G. 'Story'-based message with negative ending (e.g., "Driving home from shopping centre with kids; an electric scooter crosses the car's path; due to high speed, could not brake in time ... and the car crashes")					

Sources: www.transport.nsw.gov.au/roadsafety/resources/marketing-campaigns#Marketing_campaigns

www.tac.vic.gov.au/road-safety/tac-campaigns

streetsmarts.initiatives.qld.gov.au/initiatives/is-it-worth-it/

Q11: What type of licence do you have? *Please choose your answer.*

- Full licence
- Provisional licence (Red P, Green P)
- Learner's licence
- Overseas licence

Q12: Attitude toward in-car rapport
[5-point scale – rotating grid]

For the following statements, on road safety advertising, please answer from 1–5 (1=strongly disagree and 5=strongly agree).

- I like to see a close relationship between the car driver and the passengers.
- Watching a car driver enjoying interaction with the passengers is a good idea.
- I like to see the car driver taking a personal interest in the passengers.

Q13: What type of road safety advertising message motivates you to adopt the advice given? Please choose appropriate option.

Message type	Most unlikely	Unlikely	Neutral	Likely	Most likely
A. 'Fear' message (e.g., "Stop it or cop it")					
B. 'Humour' message (e.g., "Drive hammered, you'll get nailed")					
C. 'Guilt' message (e.g., "Is it worth it?")					
D. 'Suggestion' message (e.g., "Don't trust your tired self")					
E. 'Social interaction' message (e.g., "Go together")					

Sources: www.transport.nsw.gov.au/roadsafety/resources/marketing-campaigns#Marketing_campaigns

www.tac.vic.gov.au/road-safety/tac-campaigns

www.streetsmarts.initiatives.qld.gov.au/initiatives/is-it-worth-it/

Q14: Your intention to adopt the advice given in road safety advertising [5-point scale - rotating grid]

For the following statements, please answer from 1–5 (1=strongly disagree and 5=strongly agree).

- I plan to adopt the advice given in road safety advertising in the future.
- I am willing to adopt the advice given in road safety advertising.
- I intend to adopt the advice given in road safety advertising.

Q15: Your attitude toward road safety advertising messages

[5-point scale – rotating grid]

For the following statements, please answer from 1–5 (1=strongly disagree and 5=strongly agree).

- I think it is good to see road safety advertising messages.
- I like adopting the road safety advertising messages.
- I find it interesting to see road safety advertising messages.

Q16: Self-congruency: How does road safety advertising relate to how you see yourself and how others see you?

[5-point scale – rotating grid]

For the following statements, please answer from 1–5 (1=strongly disagree and 5=strongly agree).

The image of the typical driver is similar to how I see myself.

The image of the typical driver is similar to how others see me.

The image of the typical driver is similar to how I would like to see myself.

The image of the typical driver is similar to how I would like to be seen by others.

Q17: Self-referencing: How would you describe yourself in relation to your self-image?

[5-point scale – rotating grid]

For the following statements, please answer from 1–5 (1=strongly disagree and 5=strongly agree).

- My close relationships are an important reflection of who I am.
- When I think of myself, I often also think of my close friends and/or family.
- If a person hurts someone close to me, I also feel personally hurt.
- In general, my close relationships are an important part of my self-image.

Q18: Your reaction to road safety advertisement (advertising transportation)

[5 point scale – rotating grid]

For the following statements, please answer from 1–5 (1=strongly disagree and 5=strongly agree).

1. I can picture myself in the scenes shown in a typical road safety advertisement.
2. I usually get engaged in a road safety advertisement while watching it.
3. I want to see how a usual road safety advertisement ends.
4. Usually, road safety advertisements affect me emotionally.

Q19: Temporal construal level (gain and loss): Your attitude to gains and losses now and in the future

[5-point scale – rotating grid]

How effective at making you change your behaviour do you find the following styles of road safety advertising? Please answer from 1–5 (1=not effective and 5=very effective)

- Road safety advertising that focuses on an immediate gain today (e.g., no car crash now).
- Road safety advertising that focuses on a gain in the future (e.g., life continues as usual tomorrow).
- Road safety advertising that focuses on an immediate loss today (e.g., a speeding ticket now).
- Road safety advertising that focuses on a loss in the future (e.g., a speeding ticket in my mailbox in the near future).

Q20: Cognitive load: How important are each of the following criteria to you in a road safety advertisement?

[5-point scale – rotating grid]

For the following statements, please answer from 1–5 (1=strongly disagree and 5=strongly agree).

- The explanation in a road safety advertisement should be very clear.
- Low mental effort should be all that's needed to understand a road safety advertisement.
- The content of a road safety advertisement should be very simple.

Q21: Ideal road safety awareness advertisement: In an ideal road safety awareness advertisement, what would you prefer?

Please select your preference.

Q21a. I think an ideal road safety advertisement is most effective when a car driver's gender is:

- a. male driver
- b. female driver
- d. no driver

Q21b. I think an ideal road safety advertisement is most effective when a car driver's passenger is/are:

- a. kids
- b. family
- c. friends/colleagues
- d. no one in the car

Q21c. I think an ideal road safety advertisement is most effective when a message is:

- a. in a text-only format only
- b. in a verbal audio format only
- c. combined text and verbal format
- d. pictorial format only
- e. combination of pictorial and text format
- f. combination of pictorial and audio format

Q21d. I think an ideal road safety advertisement is most effective when the distraction inside the car is:

- a. Audio-related, e.g., loud noise, music, etc.
- b. Visual-related
- c. Thinking-related
- d. Behaviour-related e.g., adjusting mirrors.

Q22: What do you want to see in road safety advertising messages?

Which type of road safety messages do you think have a greater impact on you?

Please tick your choice.

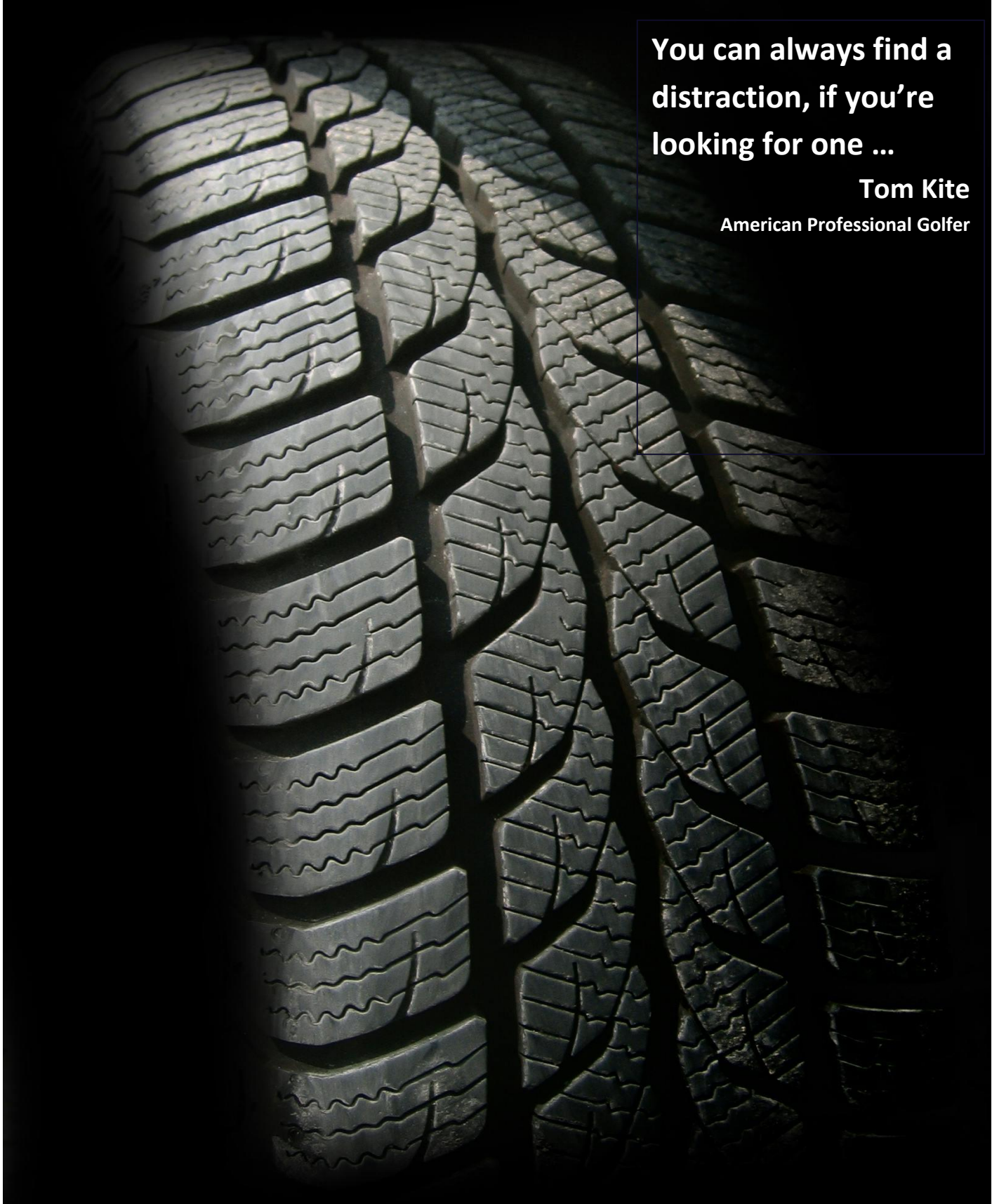
- i. A focus on negative outcomes (accident, loss of life, damage to people or property)
- ii. A focus on positive outcomes (near-miss, prevention of accidents, people and property are safe)

Q23: Consider the following types of distraction, audio (hearing), visual (seeing), behaviour (doing) and thinking. Mention which single distraction type from the above four types of distraction that you think you are most vulnerable to while driving.

.....

- a. What strategies do you take to prevent yourself getting distracted while driving?
(100 words maximum)

.....



**You can always find a
distraction, if you're
looking for one ...**

Tom Kite

American Professional Golfer