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Rejali, Sina; Kaye, Sherrie Anne; Watson-Brown, Natalie; Senserrick, Teresa; Oviedo-Trespalacios, Oscar

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Drivers' perceptions of improving official information and road rules for distracted driving: Enhancing content, design, and delivery

Sina Rejali [a,*], Sherrie-Anne Kaye [a], Natalie Watson-Brown [a], Teresa Senserrick [b], Oscar Oviedo-Trespalacios [c]

[a] Queensland University of Technology (QUT), Faculty of Health, School of Psychology and Counselling, MAIC-QUT Road Safety Research Collaboration, Australia
[b] University of Western Australia, Western Australian Centre for Road Safety Research, M304, Perth, WA 6009, Australia
[c] Department of Values, Technology, and Innovation, Faculty of Technology, Policy and Management, Delft University of Technology, Jaffalaan 5, 2628 BX Delft, the Netherlands

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ABSTRACT

Distracted driving continues to be a significant risk to road safety. While effective legislation and education are essential for preventing distracted driving, there is evidence showing that current official information and road rules related to distracted driving may not provide drivers with a comprehensive understanding of the issue. Therefore, this study aimed to explore drivers' perspectives on how official information and road rules could be improved to effectively address distracted driving. Semi-structured interviews were conducted with 35 drivers from Queensland, Australia, with thematic analysis employed to extract key themes from the discussions. The results showed that official information on distracted driving could benefit from more comprehensive content, including underrepresented distraction sources (e.g., using a smartwatch, interacting with passengers, and looking at advertisement billboards), the safety risks, and impacts on driving performance. Participants emphasised the need for distracted driving legislation to address the risks posed by a broader range of technological devices (e.g., infotainment systems, wearable devices), not just hand-held mobile phones. The results suggested a need for improved presentation of information, with future distracted driving content suggested to be presented visually, along with more targeted messaging for high-risk drivers such as young drivers. Further, social media, short training, and outdoor media were perceived by participants as the most effective delivery mechanisms for distracted driving resources. The findings provide valuable guidance for policymakers in establishing and communicating information and road rules for distracted driving.

* Corresponding author.
E-mail address: s.rejali@qut.edu.au (S. Rejali).

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1. Introduction

1.1. Research background

Drivers who engage in distracted driving are a persistent risk to road safety, with distracted driving being a major factor in road crashes and resulting injuries and fatalities. Distracted driving refers to the diversion of attention from the primary task of driving to a secondary activity (Regan et al., 2011). Engaging in such competing activities can notably impair driving performance, resulting in difficulties maintaining safe speeds and lane-keeping, slower reaction times and responses to the actions of other road users (Regan & Oviedo-Trespalacios, 2022). Distracted driving can stem from sources inside the vehicle, outside the vehicle, or from the driver themselves, and involves different types of stimuli, including visual, cognitive, auditory, and physical distractions (WHO, 2011).

Recent research on distracted driving, particularly in developed countries such as the US and Canada, shows that engaging in distracted driving behaviour is common among drivers (Cox et al., 2023; Lyon et al., 2021). This prevalence explains the significant contribution of distracted driving to road crashes and subsequent injuries and fatalities (Rejali et al., 2024). For instance, NHTSA (2021) reported that distracted driving was responsible for 3,522 fatalities, accounting for 8 % of all traffic-related deaths in the US in 2021. These findings align with studies conducted in Australia and several European countries, which also highlight the significant role that distracted driving plays in road crashes (Beanland et al., 2013; Sundfør et al., 2019). In response, various countermeasures have been implemented, including establishing road rules, enforcement measures, and driver education. For example, in Queensland, Australia (where the current study was based), distracted driving is regulated by rules that include prohibiting drivers from using a hand-held mobile phone while driving, which is enforced by police and through automated camera enforcement technologies (Queensland Government, 2024). However, the long-term effectiveness of these combined distraction countermeasures in reducing distracted driving has not been thoroughly evaluated. Additionally, drivers perceive a low chance of being caught for phone use distraction under the current enforcement measures (Kaviani et al., 2020), which can ultimately result in higher intentions to engage in risky behaviours (Nguyen-Phuoc et al., 2024).

In addition to road rules and enforcement measures, educational programs and public awareness campaigns often play an important role in promoting understanding of the issue and increasing awareness among the public. For example, Allee et al. (2018) examined the effects of high school educational programs on distracted driving among teenagers and found that, although the programs can improve attitudes and knowledge about distracted driving in the short term, their long-term impact remains uncertain. Further, Linden et al. (2019) evaluated the effects of a distraction-focused curriculum on high school students' attitudes and knowledge and reported an increase in participants' knowledge of distracted driving post-program. In another study, Hill et al. (2020) assessed the impact of an in-person, work-based training program aimed at reducing distracted driving. The findings indicated that the program was both effective and engaging, leading to a significant increase in participants' awareness of the risks associated with distracted driving. Although most interventions aimed at reducing distracted driving have generally been found to be effective, their evaluation is limited by the lack of long-term assessments and control groups (Nicolls et al., 2024). Further, a gap exists between theoretical concepts and the practical implementation of distracted driving campaigns, with the success of these initiatives largely depending on the relevance of their content and the specific target audience (Diegelmann et al., 2020; Gauld et al., 2019). Although past research has mostly focused on the outcomes of these educational programs, there is limited understanding of drivers' attitudes toward them. For instance, there is a gap in the literature regarding how drivers perceive the effectiveness, impact, and credibility of these initiatives, or how they prefer to receive this information.

While both effective legislation and education are essential for preventing distracted driving, incomplete or ambiguous rules and information can result in drivers forming low risk perceptions of distracted driving behaviours. Past evidence suggests that current information and road rules on distracted driving may not provide a comprehensive understanding of the issue to drivers. For instance, Rejali et al. (2024c) conducted a content analysis of official online materials related to distracted driving in Australian states and found that government information and road rules inadequately address distracted driving, neglecting several important aspects of this behaviour. In another study, Kaviani et al. (2021) identified a need for clearer and more effectively communicated legislation concerning distracted driving in Australia. Similarly, Ferguson and Winn (2023) highlighted the necessity of improving the delivery of safety information to drivers in Australia in a manner that is both accessible and easy to understand. In summary, past evidence suggested the need for clearer, more comprehensive distracted driving rules and information for drivers. Considering these findings, further investigation is necessary to assess drivers' views and opinions on the content and delivery mechanisms of information and road rules regarding distracted driving, with the aim of enhancing the current materials.

2. Aims and contributions

Current distraction-related official information and road rules may not provide drivers with a comprehensive understanding of the issue. While these resources predominantly focus on mobile phone use, they often overlook other forms of distraction, contributing to confusion regarding legal and/or illegal distractions. Furthermore, many drivers hold inaccurate beliefs about safety, leading them to engage in distracted driving and exploit loopholes in the rules without fully understanding the risks involved (Rejali et al., 2024b). There is a notable gap in the literature regarding how drivers believe future information and road rules should be improved to address these shortcomings. Since little is known about drivers' views on the presentation and dissemination of such information, gaining insights into their perceptions is important for developing more effective strategies to reduce distractions on the road.

To address this gap in the literature, this study explored the following research question: *What are drivers' views on improving the content and delivery of information and road rules about distracted driving?* The present study has two main contributions. First, this study

provides insights into a sample of drivers' perspectives on improving the content of information and road rules related to distracted driving; what is effective and what is lacking. By considering the limitations of existing materials, this research sheds light on how drivers believe future information should be expanded to address the full spectrum of distractions. Second, the study contributes to the discussion on the presentation and communication of information and road rules for distracted driving. By exploring drivers' opinions regarding how such information should be designed and communicated, this study offers insights into more effective structure and distribution methods.

2.1. The context of the study

Road safety regulation and enforcement measures are specific to each state and territory in Australia. This research was conducted in the context of Queensland, where distracted driving is legislated by a set of rules. The use of hand-held mobile phones while driving is prohibited, and drivers are not allowed to operate any function of a mobile phone. The penalty for violating this law is AUD$ 1209 (approximately USD$770), along with four demerit points (the demerit point thresholds are 4 points within 12 months for learner and provisional drivers, and 12 points within 3 years for open licence holders, exceeding which can result in license suspension). This law is enforced through direct police intervention and mobile phone detection cameras positioned throughout Queensland (Queensland Government, 2024). Further, first-year provisional drivers under 25 years old are restricted from carrying more than one passenger under the age of 21 when driving between 11:00 pm and 5:00 am. Additionally, passengers are not allowed to use mobile phones on loudspeaker mode during these trips. In addition to these restrictions, Queensland legislation prohibits driving with a television receiver or visual display unit visible from the driver's seat. Broader rules also cover distracted driving, including careless driving, interference with vehicle control, and maintaining proper control over the vehicle (Queensland Government, 2009). In addition to the road rules and mobile phone cameras, educational campaigns and online resources have been disseminated in Queensland to educate the public on the associated risks of this behaviour. For instance, the Queensland Department of Transport and Main Roads (TMR) launched the "Safer Roads, Safer Queensland" campaign, focusing on reducing road crashes caused by distracted driving. Further, the "StreetSmarts" education platform was introduced, targeting the reduction of road fatalities from the "fatal five" factors, one of which is distracted driving (StreetSmarts, 2023).

3. Method

3.1. Study design and procedure

To explore drivers' views on different aspects of future information and road rules regarding distracted driving, this study adopted a qualitative research approach. The focus of qualitative research is on the depth and quality of data rather than on generalisability (Opdenakker, 2006). Similarly, in this study, the objective is to gain a nuanced understanding of the issue to ensure that participants provide relevant data that aligns with the study's aims, rather than aiming to generalise findings to a larger population. To facilitate efficient participant recruitment, the study employed various strategies, including using the university webpage and utilising snowball sampling. Participation required individuals to be 18 years or older, hold a current provisional (restricted) or open (unrestricted) Queensland driving licence, and reside in Queensland. An information sheet was provided to participants regarding the objectives of this study before their involvement. Data collection was conducted through face-to-face semi-structured interviews, which allowed for focused discussions that remained aligned with the study's scope while maintaining the flow of the conversation.

To facilitate the elicitation of drivers' views, interviews incorporated both stimulus materials and mind-mapping techniques. The

Table 1
Participants characteristics.

Variable		Frequency	Percentage
Age		Mean = 39.80 years, SD = 13.31	
Gender	*Male*	14	40 %
	Female	21	60 %
Licence type	*Full Licence*	33	94.3 %
	Provisional/probationary	2	5.7 %
Driving experience		Mean = 19.70 years, SD = 14.24	
Weekly driving hours	*Less than 5 h per week*	9	25.7 %
	6–10 h per week	20	57.1 %
	11–20 h per week	6	17.2 %
Previous crash in the last 3 years	*Yes*	6	17.1 %
	No	29	82.9 %
Previous distracted driving crash in the last 3 years	*Yes*	3	8.6 %
	No	32	91.4 %
Previous infringement in the last 3 years	*Yes*	10	28.5 %
	No	25	71.5 %
Previous distracted driving infringement in the last 3 years	*Yes*	4	11.4 %
	No	31	88.6 %

stimulus materials, consisting of examples and texts about distracted driving information and road rules, were presented to participants to prompt critical reflection and stimulate detailed discussions (Törrönen, 2002). In addition, a collaborative mind-mapping process was employed, where the interviewer and participants jointly developed a visual representation of the topics discussed. This approach allowed participants to actively modify and expand the mind map, creating a structured visual framework that illustrated the perceived relationships between different themes (Frerichs et al., 2018). Each interview took between 45 and 75 min and was audio-recorded to ensure accurate and comprehensive data capture. To acknowledge participants' contributions to this study, each participant was provided with a AUD$40 (approximately USD$25) gift card on completion of the interview.

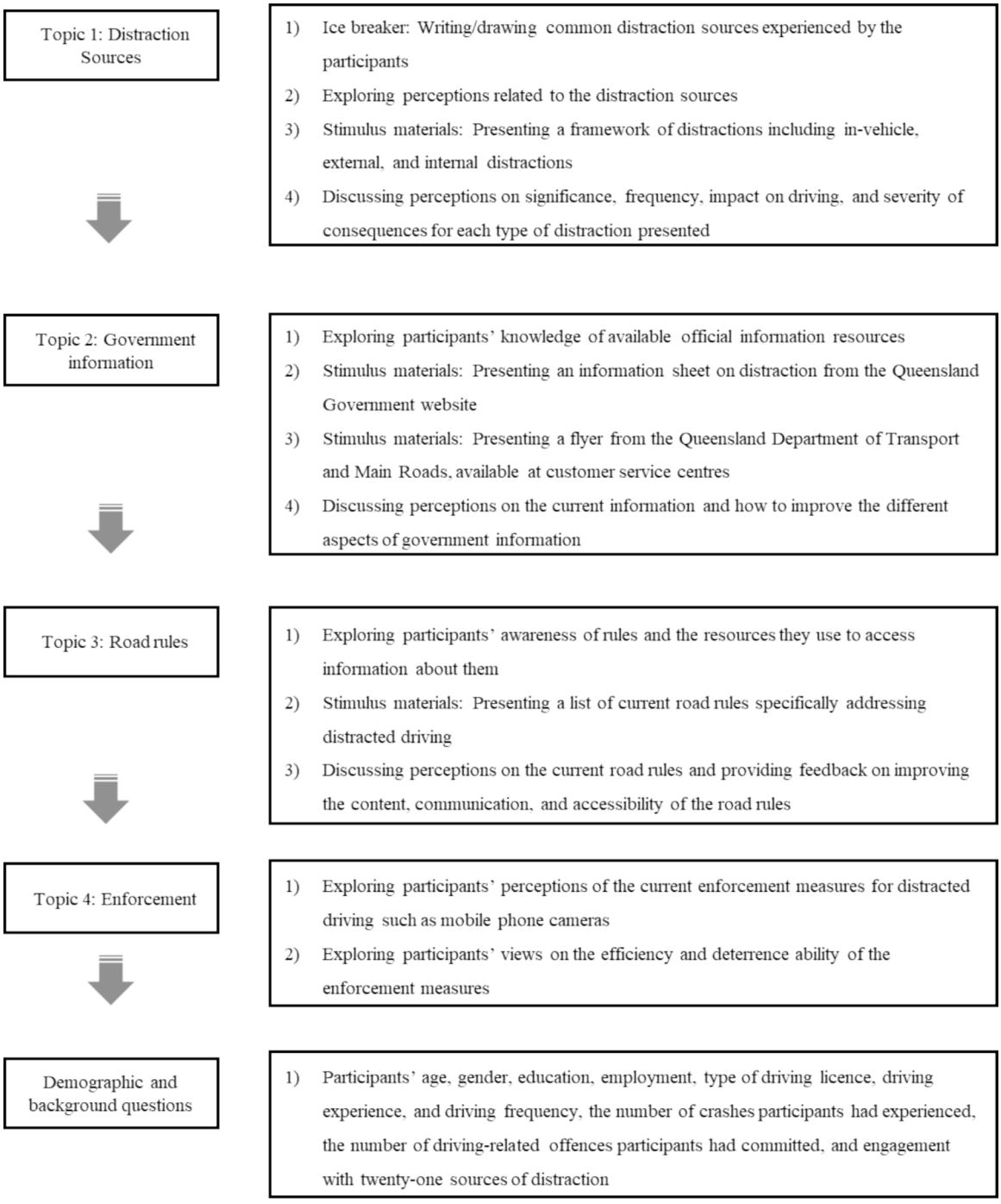

Fig. 1. Interview schedule and overarching topics covered.

3.2. Participants

The sample consisted of 35 drivers from Queensland, ranging in age from 21 to 70 years (M = 39.80, SD = 13.31). Of these participants, 21 were female and 14 were male. This sample size was considered adequate, as data saturation was reached after interviewing 30 participants, suggesting that further interviews would not yield additional insights. Saturation is a concept in qualitative research, focusing on achieving a comprehensive understanding of data rather than generalising findings (Fusch & Ness, 2015). Moreover, the sample's information power was considered sufficient due to the sample specificity, the high quality of the interviews, and the study's targeted approach, which aimed at an in-depth examination of specific experiences and perceptions (Malterud et al., 2016). Table 1 provides a detailed overview of the participants' demographics and background variables.

3.3. Materials

The questions of the interview were structured into four topics. Fig. 1 shows the full details regarding each topic of the interview. First, participants' views on distraction sources were explored, and participants shared their opinions on each type of in-vehicle, external, or internal distraction. Second, participants' opinions of official information were explored. After asking about respondents' knowledge of current resources, participants expressed their views on improving government information, including which distraction sources need more focus, preferred delivery methods, and the design and format of the materials. Third, the study explored respondents' perceptions of road rules in Queensland for distracted driving. Participants were initially asked about their awareness of these rules and the resources they use to access information about them. Then, participants provided feedback on improving the content of the road rules, the reliability of sources communicating these rules, and the accessibility of the information. In the last topic, participants shared their opinions on the enforcement of distracted driving, including automated camera enforcement technologies. Participants were also asked to complete a short survey after the interview, which encompassed demographic questions, the number of previous crashes, the number of previous driving-related offences, and their previous engagement with distraction sources.

3.4. Data analysis

The qualitative data in this study were analysed using the steps of the reflexive thematic analysis approach outlined in Fig. 2 (Braun & Clarke, 2021). The first step, familiarisation, was carried out by the first author, who conducted all interviews and reviewed the transcriptions. After reviewing the data, coding was conducted, aiming to capture the underlying meaning in the participants' quotes. Initial coding was performed by the first author, with the other authors contributing to the subsequent refinement and review of these codes. Subsequently, through collaborative discussions with all authors, codes with similar meanings were grouped into preliminary themes, reflecting patterns across the data set. These themes were then cross-referenced with the study's objectives to ensure alignment with the research aims and to highlight key findings. Further refinement of the themes, including the assignment of descriptive labels and comprehensive documentation, was undertaken by all authors to ensure the findings' reliability. This process ensured the validity of the research, where validity in qualitative studies is defined as the accuracy with which the analysis captures the essence of the phenomenon under investigation (Pyett, 2003).

3.5. Ethical considerations

The project received approval from the QUT Human Research Ethics Committee (approval number: 7385). This study represents the second phase of a two-phase project investigating drivers' perceptions of official information and road rules related to distracted driving in Queensland, Australia. The first phase was formative about views of distracted driving road rules and current official information, which has already been published (Rejali et al., 2024a). The second phase aimed to provide feedback on how official

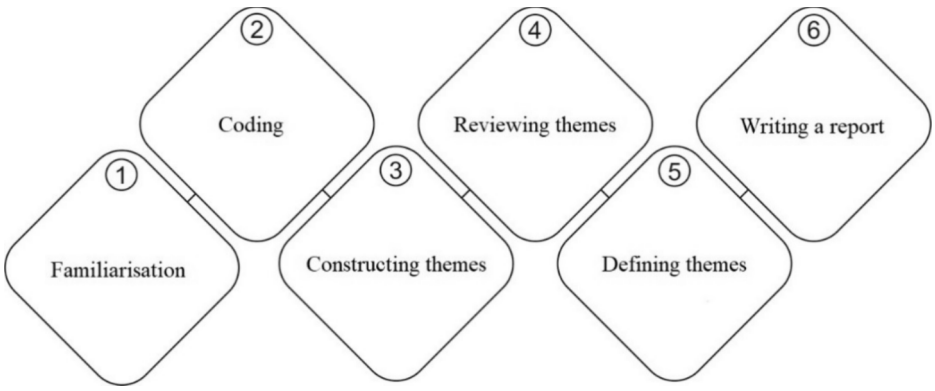

Fig. 2. The reflexive thematic analysis process
(adapted from Braun and Clarke (2021))

information and road rules can be improved in terms of content, design, and communication. Given that both studies are derived from the same interviews, several measures were implemented during the study design and data analysis process to ensure the two studies remain discrete. Each phase of the research addressed unique and meaningful research questions. The two-phase design facilitated deeper and more focused analyses, yielding distinct and valuable contributions to the field. This approach also helped overcome challenges associated with data collection and related costs while maintaining research quality. Furthermore, the interview questions were carefully developed to align with the objectives of each phase. Specifically, questions in phase 1 focused on participants' views and perceptions of existing official information and road rules and how these perceptions influence driving behaviours, whereas

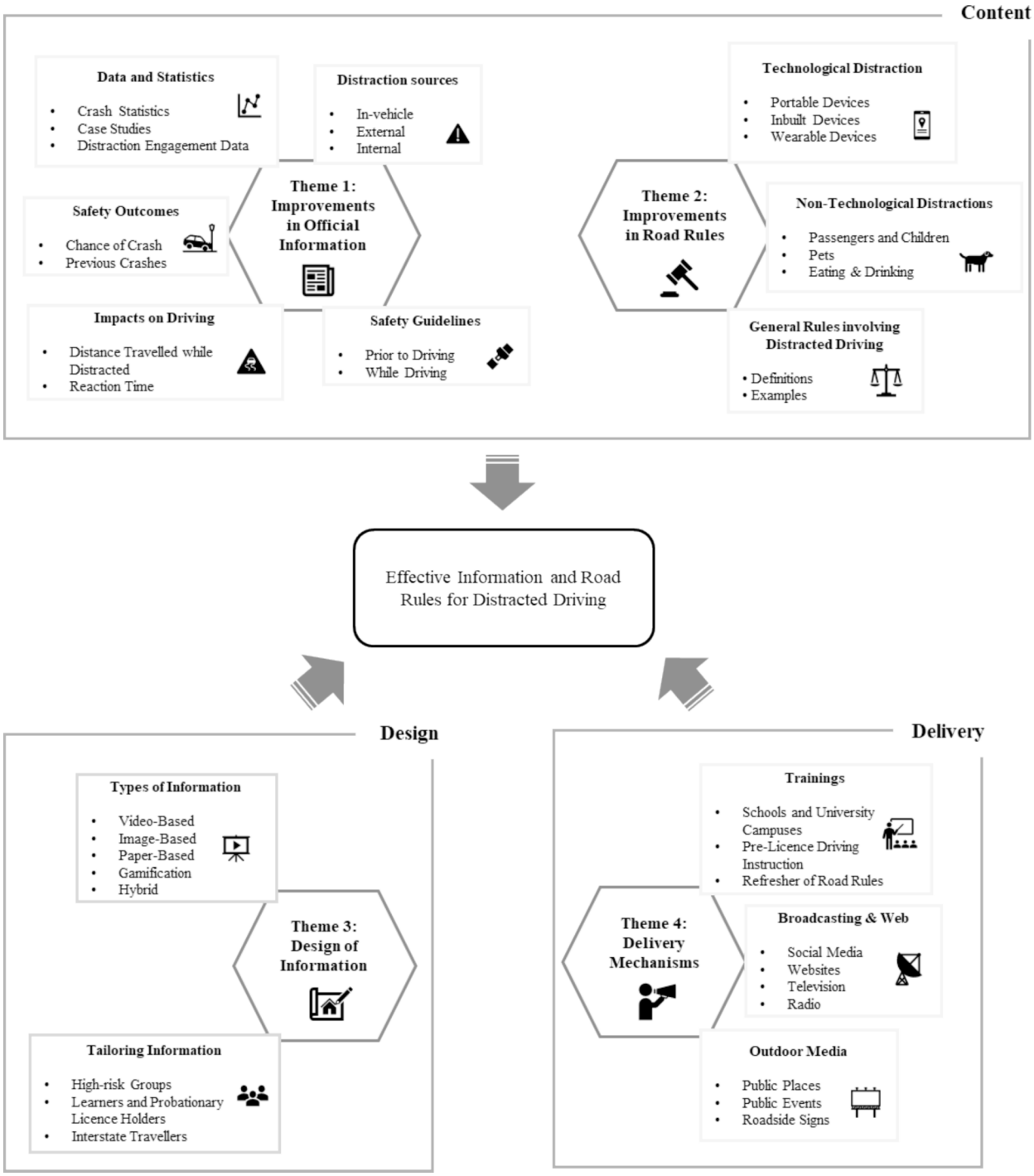

Fig. 3. Identified themes and subthemes expressed in the interviews.

questions in phase 2 (the present study) explored potential improvements. This clear delineation ensured that quotes and findings were appropriately separated for each research objective, preventing overlap or repetition between the two studies.

During data analysis, and in accordance with the principles of reflexive thematic analysis (Braun & Clarke, 2021), which emphasise in-depth, purpose-driven analysis while ensuring clarity and transparency, no quotes were reused across the two phases given that the interview questions were structured to address distinct research aims. These measures align with scholarly discussions supporting that, in qualitative research, using the same interviewees does not necessarily constitute data overlap (colloquially referred to 'salami slicing'). Instead, concerns arise when portions of the same interviews are distributed across multiple papers without distinct contributions or when the same quotes or themes are repeatedly used (Janghorban & Azarkish, 2019; Koul et al., 2021). Further, this study adheres to the Standards for Reporting Qualitative Research (SRQR) to enhance the transparency, rigor, and clarity of qualitative research reporting (O'Brien et al., 2014).

Participation in this research project was entirely voluntary. Participants could withdraw at any time during the interview without providing a reason or facing any penalty. Any personal information that could potentially identify participants was removed or altered before disseminating the summary of results or sharing data with other researchers. To protect participant confidentiality, all quotes are presented with gender and age identifiers only (e.g., Male, 25).

4. Results

Four main themes were identified from the data. Fig. 3 presents the themes and respective subthemes. Theme 1, improvements in official information, and theme 2, improvements in road rules, encompass the respondents' perspectives on the content and formulation of improvements in future official information and road rules for distracted driving. Theme 3, design of information, focused on participants' views on how to enhance the design and presentation of official information related to distracted driving. Theme 4, delivery mechanism, summarises the participants' opinions on how official information and road rules for distracted driving should be communicated to the public. The following subsections provide a detailed exploration of each theme.

4.1. Theme 1: Improvements in official information

Participants shared their views on what they perceive the future content of official information about distracted driving should include. In this first theme, five subthemes were identified, including *distraction sources*, *data and statistics*, *safety outcomes*, *impacts on driving*, and *safety guidelines*.

4.1.1. Distraction sources

Nearly all respondents indicated that official information should include more content about the potential distractions caused by different sources. For instance, in-vehicle distractions were mentioned by respondents, as many participants reported that infotainment systems in the car and smartwatches need greater emphasis in guidelines. They stated that infotainment systems function similarly to mobile phones and are often used by drivers while driving, potentially as an alternative to using a mobile phone.

"Most of the cars at the moment have, like CarPlay things, and not many people are using the holder for phone anymore. They usually touch the screen. First of all, I think it needs to be there." (Female, 33).

"In my mind, smartwatches, is sort of a similar distraction to phones. So, I would, although I never specifically seen that anybody mentioned it in the information, I think it is, it's a solid distraction." (Female, 57).

"I think some people think that the infotainment systems are safe, because it's inbuilt into your car, and it is safer than using a phone, but it's still also distracting. So, it is important to reminding people that that can be distracting." (Female, 29).

Further, several participants noted that with the introduction of new vehicles equipped with advanced technologies, drivers may become distracted by the complexity of vehicle controls and driving assistance systems, particularly for those transitioning from older models with simpler systems. They emphasised the importance of including information on the risks associated with the distracting aspects of these technologies in the guidelines.

"Because I've got a new car. I think that because the technology in new vehicles is so advanced, I think it would be useful to have an information program that focuses on adjusting the vehicle audio *or talk through these because the last car I owned was 20 was built 20 years ago. So, there's a lot more technology and a lot more potential to be distracted by trying to work out how it all goes together. So, I think it could be really useful to broaden the scope of information. So, include some of these other in vehicle distractions." (Female, 58).*

Some participants also mentioned that passengers, especially children, may be distracting to drivers. Pets were also identified by a few respondents as a potential distraction, with many owners bringing pets along while driving, underscoring the need for more comprehensive guidance on safe travel with pets. Additionally, some respondents noted that eating and drinking while driving are distractions and suggested that clearer information about the road rules related to these behaviours should be provided to drivers.

"I would say for example, the passenger next to the driver, I would love to know that what is the role for those people like sitting next to you." (Female, 33).

"Foods and drinks are a major one. I don't know the rules on food in Queensland, but for foods like when people try to pick it up while driving, I think information can cover with these ones." (Male, 35).

Many participants expressed the need for more comprehensive information on the risks associated with internal distractions. They noted that drivers often face cognitive distractions, including daydreaming, medical impairments, and stress. Therefore, future guidelines should provide more detailed information to enhance understanding of the risks these distractions pose.

"I think people should know that. If you feel sleepy or stressed, definitely that will affect your driving and affects everything." (Male, 42).

"I think just reminding people is important because I don't agree that they should stop doing that, because it's impossible to stop your emotional impairments and things like that. That's not how human beings work. I think reminding them to be a bit more cautious that these things can potentially lead to distracted driving." (Female, 29).

Several participants suggested that official information should include more details about the risks of external distractions. They believed that although these distractions may be difficult to regulate or enforce, they remain important distractions in terms of risk. Among external distractions, advertising billboards were specifically mentioned by a few participants as a source that needs more attention in official information.

"I think, they should be mentioning the external distractions as well, and how it can take your attention away from driving. I mean, I know that it's not really something that you can regulate or enforce, but it's still encompassed within getting distracted." (Female, 28).

"I would like to see more about big advertising billboards that change. Yes. Because the ones that there are ones that were just standalone, they never changed, they're fine, but those changes, then you're waiting for the next one advertisement to come up or you're driving or wherever you are. Yeah, so that something like that to be included in the information." (Female, 54).

4.1.2. Data and statistics

In the second subtheme, participants suggested that future information could gain greater credibility by including data and statistics related to distracted driving. For instance, a few respondents mentioned that providing statistics related to distraction-related crashes could increase drivers' awareness of the consequences of distracted driving. Additionally, some respondents reported that using statistics could enhance the credibility of future information. Some participants also suggested that incorporating specific case studies on distraction-related crashes might promote the understanding of the risks associated with distracted driving. Furthermore, a few participants mentioned that presenting statistics on the frequency of engagement with underrepresented distractions could highlight the distractions that have received limited attention in past information.

"I like stats, I like statistics, because it tells me some research has been done. And I'd like to see the source of that research. Because if research has been done around something, depending on how it's been done, it could add some credibility to what they're telling us. So, I would like to see stats and I would like to see some strategies how I can stop doing such and such." (Male, 36).

"Whether that be like crash statistics or even like case studies where there have been car accidents, so which are either serious or are not as serious, so that people can really understand that this could happen to them and that it can, like there are consequences from it." (Female, 30).

4.1.3. Safety outcomes

The third subtheme highlighted that participants believed future information on distracted driving should include more details about safety outcomes. Specifically, many participants expressed that receiving clear information about the possible consequences of driver distraction could increase drivers' understanding of the seriousness of this risky driving behaviour. Further, a few participants mentioned that highlighting previous crashes as a potential consequence of distracted driving and identifying the sources of distraction involved in those crashes, could help people recognise the severe outcomes of distractions they might have previously underestimated.

"I think focusing on what happens if you get caught, Or the absolute worst-case scenario of you know, crashes, fatalities, is probably a like shock, it's shock, which is what gets people's attention." (Female, 46).

"Showing that this is where you can end up. This is what can happen, so I think people seeing the end of what can happen, there is this percent chance that it can happen. it's going to hit." (Male, 35).

4.1.4. Impacts on driving

Participants expressed interest in including future information on the impacts of distracted driving on driving performance, specifically how different sources of distraction, which have received less attention in past information, can affect driving behaviour. Several participants noted that research-based information on the distance travelled while drivers are distracted could effectively emphasise the risks of distracted driving. They also suggested that understanding this information could encourage drivers to adopt a comprehensive approach to prevention, recognising that any distraction, regardless of its source, can significantly impair driving performance. Additionally, a few participants highlighted the need for more details on how reaction times are affected by various distractions, suggesting this could further illustrate the impact of distraction on driving in future guidelines.

"I think simple and easy to grasp connections between distractions. And, you know, like these things about how far this will go and move in a short time. That sort of that sort of information, I think, would catch my attention." (Male, 52).

"If you say how short that time is when you're not looking at the road or not concentrating on where you're driving, how far your car moves, and how much effect that can have, and saying, you know, distraction can be sort of from anywhere, but this is the effect. I actually think that will probably create awareness. You sort of talk about the action of distraction, not about all the different causes." (Female, 31).

4.1.5. Safety guidelines and self-regulation

Many participants also expressed the need for future information on safety guidelines and self-regulation when engaging with different sources of distractions. Several drivers noted that distractions are frequent and sometimes unavoidable, so having comprehensive information on managing distractions while driving can be useful. Some participants mentioned that safety guidelines should include measures drivers can take before starting their trip to reduce potential distractions. A few participants also suggested that information should cover actions drivers can take during the trip to mitigate risks while engaging with potential distractions.

"I think that there should be some information to guide people on what to do, if they're using their smartwatches. And how to better I guess, set the notification settings before they get in the car. And I think some more information on like animals in the car, how to how to reduce the impacts there. But also, other things like how to stop yourself from daydreaming, while driving, or things that may not necessarily be considered

illegal, but also still a distraction, like putting on your makeup, doing your hair in the car." (Female, 30).

"I think there are other things that they can come up with that information about what people can do to be less distracted when driving. So, you can't stop people from daydreaming or thinking about things, but you can assist people with it to have lower impacts on driving." (Female, 54).

4.2. Theme 2: Improvements in road rules

In the second theme, participants shared their opinions on what they perceive future road rules regarding distracted driving should entail. Three subthemes were identified including *technological distractions*, *non-technological distractions, and general rules involving distracted driving.*

4.2.1. Technological distractions

First, most participants noted that, in addition to mobile phones, there are other technological distractions that can divert drivers' attention away from the road. They mentioned portable devices such as tablets and music players, inbuilt devices like infotainment systems, and wearable devices like smartwatches. Several participants expressed that they consider hand-held use of portable devices or touching wearable and inbuilt devices just as risky as using a hand-held mobile phone while driving and believed that future road rules should address them.

"From what I know, you can kind of accept calls and see texts and things like that with your smartwatch. So, and you get alerts. And I guess that would be distracting in some way, because it's right there probably where your hand is on the steering wheel. So, I would kind of pretty much put it in the category of a phone." (Female, 46).

"I think what we were saying about all kinds of electronical devices, electric, like, even the iPod and everything, I think that should be included just as much as phones." (Male, 21).

Some participants also suggested that with the advancement of technologies, additional devices may emerge that could also pose a distraction to drivers; therefore, road rules should encompass all smart or technological devices that could potentially distract drivers. A few respondents also noted that although incorporating these devices into current road rules could present enforcement challenges, it is still necessary to address them.

"I would say smart devices, or electronic devices, would be better, rather than just concentrating on one. And I think that it would also help the completeness of the rules. Moving forward, as technology advances, there could be other types of devices that could be distracting." (Female, 30).

"I think, the use of smartwatches, it's something that I think should be included, even though it can't be policed. I think that if I was in a car accident, because I was talking to my watch, I should be charged with it. I mean, if you can't use your phone, you shouldn't be able to use your watch." (Female, 58).

4.2.2. Non-technological distractions

In the second subtheme, participants highlighted some non-technological distractions that could be addressed by road rules. Firstly, many respondents reported that pets can be a source of distraction in the car. They noted that, as current road rules in Queensland do not prohibit commuting with pets without a harness, it should be compulsory that pets must be harnessed while driving. In addition to the distraction caused by unrestrained pets for the driver, a few participants also mentioned that pets can create some level of external distraction for other drivers as well.

"I've seen my friend keep asking about her pet, don't move don't go, don't come. You know, I think that it's a source of distraction and pets need to be in the rules." (Male, 37).

"I've seen like dogs half out a window, which surely is not safe. So, I think that there should be rules the same as making sure that your kids are constrained in the back or passengers are wearing seatbelts. I think that animals should be treated the same for their safety and to reduce distraction." (Female, 30).

Some drivers also expressed negative opinions about eating and drinking while driving and the lack of inclusion in the current road rules. They acknowledged that drivers need to be aware of the risks associated with eating and drinking while driving but argued that these actions can sometimes help reduce other types of distractions, such as impaired driving or cognitive distraction. Additionally, some drivers mentioned that individuals with medical conditions (e.g., diabetes) may need to eat while driving. However, one driver argued that not smoking while driving should be included in the road rules.

"If you're driving while tired, just you know, having some water or a cup of tea or something can wake you up, make you more focused. And I think that, particularly people with medical conditions that have diabetes, for example, if they're on a long trip, they probably have to eat. So no, I don't think they need to be in the road rules. But I think that people need to be aware that it is a distraction, and that it must be done with caution. Be aware that when you're eating or drinking, you are probably not concentrating as well." (Female, 60).

"I think that there are other distractions that would need to be focused on and to be targeted in the laws, like smoking in the car." (Male, 35).

4.2.3. General rules involving distracted driving

A few participants discussed other aspects that general road rules involving distracted driving should cover. Several participants suggested that the definition of these rules should include more detailed explanations regarding proper vehicle control and careless driving. Furthermore, some participants emphasised the need to provide specific examples alongside the general rules to clarify situations where drivers might be fined for distracted driving.

"I really understand that this is a very hard thing to define. So, I understand that this is probably the best it can possibly get. But yeah, maybe

examples would be good. I think examples would they mean by without you care and attention. Yeah, it's a bit broad, but I think yeah, providing examples would help." (Female, 29).

4.3. Theme 3: Design of information

In this theme, participants expressed their opinions on how future official information on distracted driving should be presented. Two subthemes including *types of information* and *target audience* were identified.

4.3.1. Types of information

First, most participants stated that future official information on distracted driving should be presented in the form of short video clips. They expressed a preference for visualisations over text-based information. Additionally, some respondents noted that with the prevalence of social media, short video clips are the easiest way to convey messages about distracted driving.

"I think we now live in a society where everything is kind of video *-based formats, like social media and things. So yeah,* video*s are definitely the best way to communicate that." (Female, 29)*.

"Short video*s, I would say that, for example, when everyone is using Instagram these days, right? When you scroll now the new thing that is popping up is a short* video*.* Video *clips, probably. It's more, more engaging." (Male, 37)*.

Many participants also expressed a preference for receiving information through pictures and infographics. They noted that visuals with minimal text can effectively convey information on distracted driving. Additionally, some participants suggested that a mix of formats, such as videos and images, would be beneficial for drivers to understand distracted driving. A few participants also mentioned that incorporating gamification or paper-based materials could be an effective method of presenting information for some drivers.

"I think it needs to be more visual, more visual, like more pictures." (Female, 33).

"I tend to look at cute little infographic picture things. It's just like a nice, simple little picture and a few words. Don't get distracted. Don't do this." (Female, 25).

4.3.2. Tailoring information

In the second subtheme, participants emphasised that information on distracted driving should be targeted. Specifically, several participants suggested that future information should be designed for higher-risk age groups, such as young drivers and elderly drivers, and delivered in a targeted way. Participants noted that sources of distraction are specific to different age groups and suggested that information should reflect these variations. Some participants also mentioned that information on distracted driving should be designed differently for learner- and provisionally- licensed holders compared to drivers on an open/full licence. They believed that technology use patterns while driving such as using navigation systems differ between these licence groups, and that their lower experience requires more comprehensive information and self-regulation practices to help them manage the risks of distracted driving.

"Every generation has different habits. So, I guess people of our generation who grew up with the phone, like they were born with technology, they're always connected to technology. So, I guess like phones and like, this kind of information is good for the younger demographic. But for the older people who grew up driving with one hand and feeding the kids while driving, I think there needs to be a separate, separate message, because they're not looking at their phone." (Female, 25).

"The information needs to be written based on different age categories. Yeah, because for elder, for elder population, there might be something else a distraction. The internal ones for my age might be something different for younger one might be something different. Because the sources of distraction for people are different. Or maybe their capabilities are different. Or we can say that because the important source of distraction for each age category is different. We need different information. So, for example, for young Gen, something like mobile phone, yes. For elderly population. They need some more information that the younger one doesn't need." (Female, 33).

A few participants also mentioned that target audience should be selected based on the type of engagement with distractions, such as providing tailored information for those travelling with children.

"I think just being really thoughtful about the targeting of information, and I think that can be done with social media making sure that you are targeting information on driving with kids to people that have kids and things like driving with passengers in the car, which can be distracting for people." (Male, 43).

Some participants also believed that information should be customised for individuals travelling interstate or moving to a new state or territory. They mentioned that the differences in distracted driving rules and information between jurisdictions can be confusing and emphasised the need for comparative information for these drivers.

"I don't think there's enough information, especially for someone that moved from Sydney to Queensland. There was no explanation when I moved here on my Ps [provisional licence] and then changed to Queensland licence for my full license. There was no communication about, you know, this is the difference between New South Wales and Queensland, yeah, I think it was up to, it's definitely up to the driver to research what your full licence entails." (Female, 21).

4.4. Theme 4: Delivery mechanisms

In this theme, participants expressed their views on the best channels of communicating official information and road rules about distracted driving by governments. Three subthemes including *broadcasting and web*, *trainings*, and *ambient media* were identified.

4.4.1. Broadcasting and web

Participants highlighted that broadcasting and the internet are highly effective for conveying information and road rules about

distracted driving. Most participants noted that targeted social media advertisements are the best way to reach young drivers, who tend to watch less television compared to older adults. However, many participants also preferred television as the best channel for receiving information in this regard. Some participants mentioned that radio is also effective since many regular commuters, especially older drivers, listen to the radio frequently. A few participants also suggested creating a reference website that offers all the necessary information and road rules about distracted driving which road users could easily refer to.

"For young people, you know, I think social media, young people don't watch TV anymore. So, I think social media is probably a good way to go tick tock seems to be the thing." (Female, 58).

"I still do watch TV. So, you know, a TV ad. You know, on some channels that have ads will capture my attention." (Male, 65).

"I think depends on the target audience. So younger people, probably social media, but I think having just one resource one big resource that everyone goes to so could be websites, probably the easiest." (Female, 29).

4.4.2. Trainings

Many participants stated that they perceive training as an effective way to receive information and road rules on distracted driving. Several participants mentioned short training sessions and workshops in schools to target young people would be appropriate. Additionally, some participants suggested that information on distracted driving should be conveyed within university campuses to reach the at-risk novice driver cohort. Others emphasised that driver's licence training should comprehensively include information and road rules on distracted driving, considering it the best channel for communicating with drivers.

"If schools teach this or anything like that, I think it's something that yeah, kids will remember if it's something that's educated on." (Female, 21).

"It should be part of maybe the package of learning that learner drivers require." (Female, 70).

Some participants also mentioned that trainings should include a refresher on road rules related to distracted driving. These participants believed that drivers may have a limited awareness of distraction-related road rules and providing a refresher could be beneficial, particularly for those drivers who obtained their driver licence a long time ago.

"People will like me, you know, I passed my driving exam a long time ago. And some of the rules have changed, I guess. But also, for people that don't drive as often or travellers like, I just don't think it would hurt to have more information around." (Male, 39).

"Something needs to be put in place, too, for once a year or something like that. You need to read through this and sign off or whatever, to be able to drive on our roads." (Female, 28).

4.4.3. Outdoor media

Finally, participants suggested that outdoor media could effectively convey future information and road rules on distracted driving. Several participants mentioned advertising in public places (e.g., bus stops), at events (e.g., concerts), and shopping mall billboards as effective ways to capture people's attention. Additionally, some participants believed that road signs, if they are clear and concise, could effectively communicate information since drivers are more attentive to messages about distracted driving while on the road.

"I would probably say, for me, personally, I pay attention to the ads on bus stops at bus stops. Mostly because I'm waiting for a bus, and I can just read what's coming up on this screen there." (Male, 36).

"I think road signs could be a good one like, because it's kind of like you are driving. It can remind you to not daydream, or anything like that." (Female, 30).

5. Discussion

This study aimed to explore drivers' perceptions on how future information and road rules should be enhanced to address distracted driving more effectively. Using a qualitative approach, the findings revealed that participants believe official information should include more content about the potential distractions caused by different sources. For example, further to participants noting that current information on distracted driving primarily focuses on mobile phones (Rejali et al., 2024b), they identified that many other in-vehicle distractions, such as infotainment systems and smartwatches, have a similar potential to cause distraction. Participants highlighted the need for future information to place greater emphasis on these distractions, the effects on driver safety, and associated risks. The demand for more comprehensive information on these sources is supported by previous research showing a high prevalence of engagement with non-mobile-phone in-vehicle distractions and their associated risks. For instance, an observational study of 920 drivers in South Australia reported that 8.9 % of drivers were potentially distracted, with 4.2 % of these cases involving non-mobile-phone distractions, including holding an object and eating/drinking (Ponte et al., 2021). Another study conducted in Australia using naturalistic driving data revealed that the most frequent secondary tasks while driving involved distractions other than using handheld or hands-free mobile phones, such as adjusting in-vehicle controls (Young et al., 2020). Further, Dingus et al. (2016) reported that engaging with in-vehicle devices, such as using a touchscreen interface while driving, can increase a driver's crash risk by nearly 4.6 times. These findings show the importance of broadening the scope of future information to include a wider range of distractions and broaden the current focus from mobile phones as the primary source of distraction to other in-vehicle and technological distractions.

Participants also highlighted the need for more detailed information about the safety risks and effects of both external and internal distractions on driving performance. Consistent with this finding, a recent study examining previous government information on distracted driving revealed that several sources of distraction, particularly internal and external distractions, have been either overlooked or given limited attention in official Australian resources (Rejali et al., 2024c). Participants emphasised that drivers often encounter cognitive distractions, such as daydreaming, medical conditions, and stress. They suggested that future guidelines should offer more specific information to improve understanding of these types of distractions. This finding aligns with previous studies,

which show that cognitive distractions, in addition to visual distractions, can significantly impair driving abilities. For instance, Li et al. (2018) reported that cognitive distractions from tasks like auditory-response working memory can reduce safety margins, affecting time-to-line crossing and lane-keeping stability. In another study, Vaezipour et al. (2022) reported that drivers experiencing cognitive distractions from chronic pain have been reported to face higher driving workload, encompassing increased mental and physical demand and effort. Participants also emphasised the need for more information on external distractions, specifically mentioning advertising billboards as a source that requires greater attention in official information. However, a concern arises due to the limited research in the existing literature on the distracting effects of advertising billboards on drivers (Hinton et al., 2024). Therefore, further research is needed to better understand the full extent of this distraction's impact on driving performance and its contribution to crash risk.

Based on the results of this study, participants shared their views on potential improvements in road rules regarding distracted driving. They noted that the hand-held use of portable technological devices or touching wearable and inbuilt devices might be just as risky as using a hand-held mobile phone. Participants stated that many drivers may not perceive these distractions as equally risky and often face confusion about what is considered as legal or illegal distractions under current road rules (Rejali et al., 2024b). As a result, several participants emphasised the need for road rules to address all smart or technological devices that could potentially distract drivers, despite the enforcement challenges. This need for more comprehensive legislation aligns with previous research, which has underscored the need for clearer and better-communicated rules through formal channels (Kaviani et al., 2021). However, establishing more inclusive road rules concerning technological distractions may be difficult to enforce. Current mobile phone legislation already faces challenges, such as difficulties encountered by police in enforcement, the use of technology to share enforcement locations, and drivers' efforts to conceal their behaviours (Truelove, Stefanidis, Mills, & Oviedo-Trespalacios, 2023; Truelove, Stefanidis, & Oviedo-Trespalacios, 2023). Further, while some Australian states have implemented mobile phone detection cameras to reduce driver distraction, there is limited evidence regarding the effectiveness of this approach in reducing road crashes (Truelove et al., 2021). Similarly, while more comprehensive legislation may raise awareness of a broader range of distracted driving behaviours, the long-term impacts of such road rules on road crashes remain vague. Regarding non-technological distractions, while participants raised this concern that pets should be required to be harnessed while driving, they expressed negative views on restricting eating and drinking while driving. This opposition to regulating eating and drinking can be interpreted in two ways. First, many participants do not perceive this type of distraction to be as risky as other sources, particularly technological distractions (Rejali et al., 2024b). Additionally, this response may reflect cognitive dissonance, as drivers recognise that eating and drinking could increase secondary tasks, yet they still do not support enforcement measures for this type of distraction, often justifying their behaviour by highlighting potential benefits. However, previous evidence has reported that eating and drinking while driving can nearly double a driver's crash risk (Dingus et al., 2016).

According to the results, participants expressed their opinions on how future official information on distracted driving should be presented. They expressed a preference for visualisations over text-based information and considered short video clips on social media as the easiest way to convey messages about distracted driving. This aligns with past evidence suggesting that short video clips are more effective than longer ones, as viewers tend to have shorter attention spans, find them easier to remember, and are more likely to share them (Dai & Wang, 2023). However, it is important to consider that people are exposed to numerous messages daily, and engaging with road safety messages requires emotive, realistic, and relatable content to capture their attention effectively (Waring et al., 2024). Participants also expressed a preference for receiving distracted driving information through infographics. However, past evidence raises questions about the effectiveness of infographics in conveying road safety messages. This is particularly due to people's ability to interpret statistical information, which might inaccurately influence their decision-making processes (Steinhardt, 2020). Participants also emphasised the importance of providing targeted information on distracted driving for different groups such as high-risk drivers, learner-, and provisionally- licensed drivers. This aligns with previous research, which found that official information on distracted driving is often not tailored to the specific needs of high-risk groups, such as young drivers (Rejali et al., 2024b). Participants also reported that official information could gain greater credibility by including data and statistics related to distracted driving. They noted that providing statistics and case studies related to distraction-related crashes could increase drivers' awareness of the consequences of distracted driving and enhance the credibility of information. However, previous literature has expressed concern about using data and statistics for road safety information, arguing that people often do not fully understand how they incorporate statistical information into their judgment and decision-making processes (Steinhardt, 2020). However, using a diversity of strategies including statistics and case studies ensures the information effectively reaches the broader community.

Participants also shared their views on the best delivery mechanisms for conveying distracted driving information and road rules. They suggested that various types of training such as short information sessions and workshops in schools and at university campuses for young people might be particularly beneficial for raising awareness among this group. This perspective aligns with past research, which has shown that distraction-related education programs for students can increase knowledge about distracted driving and positively influence behaviour (Fournier et al., 2016; Linden et al., 2019). However, it is important to note that most of these programs have demonstrated only short-term effects, with minimal or no long-term impact (Hurwitz et al., 2016). Additionally, while most participants were over 25 years old, they highlighted the need for targeted training for younger drivers. This is likely because drivers perceive younger individuals are more prone to distractions, and risky driving behaviours are prevalent among them (Oviedo-Trespalacios & Scott-Parker, 2018). This perception was recently confirmed by a recent study that found middle-aged and older drivers are less likely to be distracted than their younger counterparts (Sullman et al., 2024). Participants also considered outdoor media as an effective way of communicating distracted driving information and road rules, with some specifically mentioning roadside signs as a good context-based delivery method. However, previous research challenges this view. For instance, Oviedo-Trespalacios et al. (2019) argued that roadside advertising signs can place additional demands on drivers by disrupting their eye movement patterns, with

certain devices, such as electronic billboards, increasing crash risk. Similarly, Hinton et al. (2022) reported that roadside advertising signs can lead to prolonged attentional engagement, potentially compromising safe driving performance. Considering these findings, it is important to consider the distracting potential of outdoor media as a delivery mechanism for distracted driving information.

6. Policy implications

The findings of this study indicate that future materials on distracted driving may benefit from incorporating more comprehensive content on aspects of distracted driving. For instance, providing a diversity of content types including safety outcomes of distraction, statistics and case studies, and self-regulation strategies may ensure that the information effectively reaches the broader community and promotes understanding of the risks associated with distracted driving by highlighting the potential consequences of engaging with distraction sources. Further, the results indicate the need for more targeted messaging to different groups, particularly high-risk drivers, learner-licensed drivers, and provisional licence holders. Tailoring distracted driving information to these specific groups could enhance its relevance and effectiveness. Given emphasis on the perceived higher risk and need for targeted training of younger drivers, this group should be a key focus for future educational efforts. Moreover, this is supported by a large body of research that confirms both their greater susceptibility to distractions and over-representation in road trauma.

This study also highlighted the need to reconsider distracted driving legislation to more explicitly address the risks posed by a wide range of technological devices, beyond just hand-held mobile phones. More comprehensive legislation on technological distractions could improve drivers' awareness of risky behaviours, resulting in reduced distracted driving engagement. However, due to the complexities of enforcing mobile phone regulations such as the availability of applications that allow for the sharing of enforcement locations and drivers' attempts to hide their behaviour, broadening road rules to include all forms of in-vehicle technology could further complicate these enforcement challenges.

The findings of this study suggest that future distracted driving information should prioritise using visual formats, such as short video clips, as these were preferred by participants over traditional text-based content. Policymakers should consider social media platforms to distribute engaging, brief video content, as these formats are known to better capture attention and are more easily remembered and shared (Dai & Wang, 2023). Additionally, the results suggest that training programs, particularly brief information sessions and workshops conducted in schools and on university campuses, or by integrating this content into existing school programs, could be an effective approach for raising awareness about distracted driving among younger drivers (Watson-Brown et al., 2023). While such programs have demonstrated success in increasing knowledge and positively influencing behaviour in the short term, policymakers should focus on developing strategies to extend their long-term impact.

7. Limitations and future research

This study has some limitations. First, it was conducted in Queensland, Australia, and the variations in information and roads for distracted driving across different states and countries may influence participants' opinions on future information and road rules. As a result, the findings may not be specifically applicable to other contexts. Future research should assess how different legal frameworks and cultural attitudes toward distracted driving influence perceptions and potential improvements in information and road rules across diverse contexts. This could be achieved using qualitative methodologies for in-depth understanding or quantitative methodologies for more representative perspectives. Second, the participants in this study were primarily over 25 years old and held full driving licences, which may limit the applicability of the findings to younger, high-risk populations. Young drivers are often over-represented in crash statistics and may have distinct needs regarding information and education about distracted driving. Future studies should consider employing this methodology with a focus on recruiting young drivers, learners, and probationary licence holders to ensure that their perspectives and needs are adequately represented. Further, while this study captured participants' perceptions regarding distracted driving information and road rules, future research is necessary to evaluate the feasibility and effectiveness of the suggested approaches. to determine whether the proposed methods are practical and can lead to meaningful improvements in driver awareness and behaviour. Finally, this study highlighted the need to reassess distracted driving legislation to more comprehensively address the risks associated with various technological devices beyond mobile phones. However, there is limited research on the effects of incorporating non-mobile phone technological distractions into road rules, as well as the long-term impact of such measures on crash rates and driver behaviour. Future studies should explore the effectiveness of these possible regulatory changes, assess enforcement challenges, and evaluate their influence on overall road safety outcomes.

8. Conclusion

This study highlights the need for enhanced official information and road rules to effectively prevent distracted driving. By gathering insights from drivers, the research identified key areas for improvement, including the inclusion of diverse content types, targeted messaging for high-risk groups, and innovative delivery methods such as social media and visual formats. These findings underscore the importance of adapting legislation and educational strategies to better inform drivers, contributing to improved road safety.

CRediT authorship contribution statement

Sina Rejali: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Validation, Writing –

original draft, Writing – review & editing. **Sherrie-Anne Kaye:** Conceptualization, Data curation, Investigation, Methodology, Supervision, Validation, Writing – review & editing. **Natalie Watson-Brown:** Conceptualization, Data curation, Investigation, Methodology, Supervision, Validation, Writing – review & editing. **Teresa Senserrick:** Conceptualization, Investigation, Methodology, Supervision, Validation, Writing – review & editing. **Oscar Oviedo-Trespalacios:** Conceptualization, Investigation, Methodology, Supervision, Validation, Writing – review & editing.

Declaration of competing interest

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

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Data availability

The authors do not have permission to share data.

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