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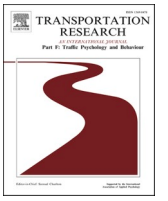

Understanding drivers' attitudes, beliefs, and behaviours about distracted driving and the relationship with perceptions of related road rules

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ABSTRACT

Distracted driving remains a significant road safety concern. To address the issue, it is important to understand drivers' perceptions of distractions and the related road rules. Accordingly, this study has three objectives. The first was to investigate drivers' beliefs and behaviours regarding distracted driving by expanding the Susceptibility to Distracted Driving Questionnaire. The second was to explore drivers' perceptions of current distracted driving rules by using the extended Value-Belief-Norm Theory and open-ended questions and to examine how beliefs and behaviours about distractions shape their views on road rules. The third was to assess the extent to which drivers perceive a need for broader distracted driving legislation and how their perceptions of current road rules contribute to this perceived need. Data were collected from 494 participants (aged 17 to 83 years), residing in Queensland, Australia, through an online questionnaire. Findings indicated a moderate level of engagement with both technological and non-technological distractions, with no significant difference observed between their levels of engagement. However, participants reported more favourable attitudes and a higher sense of control over technology-related distractions than non-technological distractions. Results also showed that while distracted driving rules were seen as fair and allowing freedom while driving, they were viewed as moderately effective and somewhat complex. Further, most participants supported the need for improved distracted driving rules, with lower perceived effectiveness and higher complexity of current rules linked to greater support. Results indicated that higher engagement with non-technological distractions was negatively associated with perceived effectiveness of rules, while greater risk compensation was linked to lower perceived fairness, and higher perceived control over distractions was significantly associated with lower perceived freedom.

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1. Introduction

Distracted driving is a significant global road safety concern. It refers to any activity that diverts a driver's attention from the primary task of driving (Regan et al., 2011). This definition highlights that an activity becomes a distraction when it interferes with tasks essential for safe driving (Feng et al., 2014). Distractions can stem from a wide range of sources and are commonly categorised into visual, cognitive, auditory, and physical types (WHO, 2011). Distractions may also be classified according to their technological nature, distinguishing technological distractions (e.g., using visual display units, smartwatches, and navigation systems) from non-technological distractions (e.g., conversations with passengers or observing roadside billboards). Studies indicate that both technological and non-technological distractions are prevalent among drivers and can impair driving performance (Laberge et al., 2004; Parnell et al., 2018; Ponte et al., 2021). As sources of distraction continue to evolve, research often struggles to keep pace with the ways in which drivers engage with new distractions. To explore distracted driving behaviours, various influencing factors, including demographic and background characteristics (e.g., age, gender, driving experience), psychological traits (e.g., attitudes toward distractions and the level of perceived risk), and behavioural patterns (e.g., driving frequency) have been identified (Cox et al., 2023; Feng et al., 2014; Kreusslein et al., 2024; Zhou et al., 2020). However, a notable gap in the literature is that previous studies have mostly focused on mobile phone use or a limited range of distraction sources. As a result, many less apparent or underrepresented distractions have not been widely explored. Therefore, from a research perspective, a more comprehensive understanding of how drivers perceive and engage in distraction sources, as well as the underlying factors that influence these behaviours, is needed to prevent distracted driving.

From a practical standpoint, previous efforts to prevent distracted driving have mostly focused on a combination of legislative measures, interventions, and messaging strategies aimed at reducing engagement in distractions. However, many countries continue to face challenges in addressing this issue, as distracted driving crashes continue to account for a significant proportion of all road crashes (Beanland et al., 2013; NHTSA, 2021; Rejali, Aghabayk, et al., 2024). In Australia, legislative approaches are the primary countermeasure against illegal mobile phone use while driving, with enforcement carried out through police officer monitoring and, in some jurisdictions such as Queensland, through mobile phone detection cameras (Queensland Government, 2024). However, the effectiveness of these enforcement measures depends on several legal an non-legal factors (Truelove, 2020). Additionally, enforcement challenges, such as the availability of technologies that enable the sharing of enforcement locations, and drivers' efforts to conceal their behaviour further complicate preventing distracted driving (Truelove, Stefanidis, et al., 2023).

While previous studies have highlighted the role of hand-held mobile phone bans in reducing mobile phone use while driving and improving driver behaviour in both the short and long term (Benedetti et al., 2023), some research presents contradictory findings, suggesting that the impact on road crashes may not be as significant as previously assumed (Olsson et al., 2020). Moreover, drivers often perceive that current road rules to be predominantly focusing on mobile phone use, leaving grey areas in addressing other distractions (Rejali, Watson-Brown, et al., 2024a). Further, a recent qualitative study indicated that drivers believe road rules should encompass a wider range of technologies beyond hand-held mobile phones (Rejali et al., 2025). However, a broad quantitative investigation evaluating drivers' views on current distracted driving rules and whether drivers believe more comprehensive regulations are needed is lacking in the literature. Therefore, addressing this gap is important for understanding drivers' perceptions of current rules and exploring potential relationships between these perceptions and the need for having more comprehensive legislation.

2. Research background

Various theoretical frameworks and questionnaires have been employed to explain distracted driving beliefs and behaviours, and their associated factors. For instance, several studies have applied intention-based models, such as the Theory of Planned Behaviour (TPB; Ajzen, 1991), to explain distracted driving (Armitage et al., 2022; Demir et al., 2023). In addition, questionnaires grounded in the TPB model have been shown to effectively explain distracted driving behaviour. For example, Feng et al. (2014) developed the Susceptibility to Distracted Driving Questionnaire (SDDQ) to understand the factors influencing driver distraction through differences in vulnerability to distraction by distinguishing between voluntary and involuntary engagement in secondary activities while driving. Findings from these studies have shown that distracted driving is influenced by various factors, including a range of individual, psychological, and social factors. For instance, some research evaluated the role of gender in distracted driving behaviours and suggested that males are more likely to engage with distractions, particularly those related to in-car technology (Cox et al., 2023; Kreusslein et al., 2024). However, other studies have reported no significant gender differences in distracted driving (Oviedo-Trespalacios et al., 2017; Schroeder et al., 2018). Studies have also examined the role of age in explaining distracted driving behaviour. For instance, while Pope et al. (2017) reported that middle-aged adults engage in distracted driving at a frequency similar to young adults, Koppel et al. (2025) stated that youth engage at higher levels and are less likely to regulate when they engage with secondary activities.

In addition to demographic characteristics, psychosocial factors, which shape drivers' beliefs about distracted driving, have also been identified as important determinants of distracted driving behaviour. Distracted driving beliefs refer to the perceptions that drivers hold about distracted driving, which influence how drivers interpret risks, form intentions, and engage in distractions (Carter et al., 2014). For instance, attitude (i.e., to positive or negative evaluations of engaging in distracting activities while driving), social or subjective norms (i.e., drivers' perceptions of whether important others approve or disapprove of engaging in distracted driving), perceived control (i.e., the extent to which drivers believe they have complete control and confidence when engaging in distractions while driving), perceived risk (i.e., drivers subjective evaluation of the likelihood and severity of negative outcomes), and compensatory beliefs (i.e., perception that drivers can offset the risks of distraction through adaptive behaviours such as reducing speed or increasing following distance) have been shown to be significant in shaping drivers' beliefs about distracted driving and, consequently,

their engagement in distracting behaviours while driving (Chen et al., 2016; Feng et al., 2014; Zhou et al., 2020). Given the evolving nature of driver distractions, further research is needed to investigate drivers' beliefs and behaviours for a wider range of distraction sources to provide deeper insights into the issue.

Beyond understanding drivers' beliefs and behaviours about distracted driving, it is also important to consider the role of these factors in shaping drivers' perceptions of road rules. Perceptions of road rules generally refer to how drivers consider and evaluate different aspects of current distracted driving legislation (i.e., the prohibition of hand-held mobile phone use while driving), which is enforced through monetary penalties and demerit points. The underlying theory that explains drivers' perceptions of different aspects of road rules is the Value-Belief-Norm theory with policy-specific perceptions (Eriksson et al., 2006). This framework suggests that drivers' perceptions of rules can be understood through four key dimensions: perceived effectiveness, which reflects whether individuals believe the policy successfully reaches its aims; perceived fairness, referring to the extent to which drivers see the policy as just, and applied equitably; perceived freedom, which captures the degree to which individuals believe the policy restricts their personal freedom; and perceived complexity, indicating whether the policy is clear, easy to understand, and unambiguous. Several studies in various road safety contexts, including pricing policies, electric vehicle standardisation, and odd-even restrictive driving policies, have applied this theoretical framework to examine drivers' views on regulatory measures. These studies consistently demonstrate that the framework offers a sound and effective approach for understanding how drivers evaluate road safety policies (Jain et al., 2021; Li et al., 2023; Sun et al., 2016). Additionally, research indicates that policy perceptions are influenced by a range of behavioural, societal, and background factors. For example, Li et al. (2023) found that perceptions of the electric two-wheeler standardisation policy were shaped by social norms and the level of public awareness of the associated issues. In another study, background variables, such as education level, were shown to influence perceptions of congestion pricing policies (Sun et al., 2016). In line with these findings, it is important to explore drivers' perceptions of road rules, along with the contextual and background factors that may influence these perceptions for developing effective road safety policies aimed at reducing distracted driving.

3. The current study

3.1. Aims and contributions

This study contributes to the existing literature by addressing important gaps in distracted driving research. First, previous studies have mostly focused on mobile phone use or a limited range of distractions when investigating distracted driving beliefs and behaviours, while many less apparent or underrepresented distractions have not been widely explored. Therefore, to provide a more comprehensive understanding of how drivers perceive and engage in distractions, and to examine potential differences in beliefs and behaviours across individual groups, this study expanded the SDDQ to assess drivers' underlying beliefs and behaviours (i.e., engagement, attitudes, perceived control, perceived risk, social norms, and compensatory beliefs) across sixteen different types of technological and non-technological distractions. Accordingly, this study addressed the following research question in relation to a much more extensive range of distractions:

RQ1. *How do drivers perceive and engage in technological and non-technological distractions, and how do these beliefs and behaviours vary across demographic and background groups?*

Second, previous qualitative studies suggested that existing distracted driving rules may not provide a comprehensive understanding for drivers about distracted driving, noting that current rules primarily focus on mobile phone use while overlooking other sources of distraction (Rejali et al., 2025; Rejali, Watson-Brown, et al., 2024a, 2024b). However, the literature lacks a quantitative evaluation of drivers' perceptions of these rules, which would contribute to the generalisability of findings. Moreover, the relationship between distracted driving beliefs and behaviours, and these perceptions remains unexplored. To address these gaps, this study examined drivers' views on current distracted driving rules through four policy-specific dimensions adapted from the extended Value-Belief-Norm theory: perceived effectiveness, fairness, freedom, and complexity (Eriksson et al., 2006). Additionally, three open-ended questions explored drivers' views on the effectiveness, coverage, and clarity of the rules to provide deeper insights. To further investigate factors shaping drivers' views of road rules, this study also examined how beliefs and behaviours about distractions are associated with perceptions of distracted driving rules. Therefore, the following research questions were addressed in this study:

RQ2*. How do drivers perceive the current distracted driving rules, and how do these perceptions vary across demographic and background groups?*

RQ3. *How do drivers' beliefs and behaviours about distractions relate to their perceptions of road rules?*

Third, past evidence from our qualitative research also indicated that drivers believe road rules should address a broader range of technologies beyond hand-held mobile phones (Rejali et al., 2025); however, whether drivers perceive a need for more comprehensive legislation and how their perceptions of current distracted driving rules may contribute to this perceived need has not been extensively explored. Building on this contribution, this quantitative research addressed the following research question:

RQ4*. To what extent do drivers perceive a need for more comprehensive distracted driving legislation, and how do their perceptions of current road rules contribute to this perceived need?*

3.2. Study context

This study was conducted in Queensland, Australia, which operates a Graduated Driver Licensing system approach to driver licensing, designed to gradually increase the exposure to driving risks for new young drivers as they gain experience and develop their driving skills (Queensland Government, 2022). The system generally includes a learner stage, one or two provisional (P1 and P2)

stages, and finally, an open licence stage. Distracted driving rules in Queensland prohibit the use of hand-held mobile phones while driving, with the restrictions vary by licence type. Specifically, open and P2 licence holders may only use a phone in hands-free mode if it is secured in a cradle or carried in a pocket/pouch and operated entirely by voice without touching or looking at the device. However, learner and P1 drivers under 25 face stricter conditions, with a complete prohibition on mobile phone use, including hands-free, wireless headsets, or loudspeaker functions (Queensland Government, 2024). The rules are enforced through mobile phone detection cameras and police monitoring, with violations resulting in penalties of AUD $1209 (approximately USD $750) and four demerit points. In addition to the mobile phone use rules, Queensland's broader road safety rules also address engagement in distracted driving via careless driving and maintaining proper vehicle control legislation.

While this program of research focuses on Queensland, it is important to note that the insights gained from this research may be applicable and beneficial to other countries and jurisdictions. The methods and theoretical framework applied in this study may be a useful reference for future research conducted across international settings, and the findings could be extended to other regions and contexts to explore similarities and differences in drivers' perceptions and attitudes.

4. Method

4.1. Study design

Before conducting this research, ethics approval for the study was granted by the QUT Human Research Ethics Committee (approval number: 8999). Data collection for this study was conducted through an online questionnaire. The questionnaire was hosted by Qualtrics, an online platform for generating online surveys. The eligibility criteria for participation required individuals to be at least 17 years old, reside in Queensland, Australia, hold a valid Australian (learner, provisional, or open) or international driver's licence, and drive a car at least once a week. The sample represents regular drivers in Queensland, Australia, as non-drivers and infrequent drivers were excluded. Sampling strategy for the data collection included convenience and snowball sampling methods. Participants were recruited through the university webpages, mailing lists, and social media advertisements, which provided convenient access to a large number of potential respondents. Snowball sampling was also used, as participants were encouraged to share the online questionnaire with others in their networks. Participants were required to complete a questionnaire that included both quantitative and qualitative items (see Section 4.3). Completing the questionnaire took approximately 20 min, and participants were informed that their involvement was entirely voluntary. Those who completed the questionnaire had the opportunity to enter a prize draw for one of six AUD$50 e-gift cards (approximately USD$35) as a token of appreciation.

Table 1
Questionnaire items for beliefs and behaviours about distracted driving.

Factors/ Questions	
Distracted driving engagement	• Use a hands-free mobile phone (e.g., holding phone conversation)
When driving, how often do you …?	• Use a hands-held mobile phone (e.g., sending text messages)
Attitudes about distracted driving	• Attend to, have conversations, or react to passengers and children
How strongly do you agree or disagree that it is alright for you to drive and do the following?	• Reach for an object in the car
Social norms	• Listen to or adjust vehicle audio system, radio, or personal music entertainment
How strongly do you agree or disagree that most drivers around me drive doing the following?	• Eat, drink, smoke, or vape
Perceived control	• Look at or use display monitors, navigation systems, or communication devices
How strongly do you agree or disagree that you can drive well even when doing the following?	• Look at a smartwatch (e.g., reading notifications)
Perceived risk	• Touch or manually interact with a smartwatch (e.g., sending text messages)
How strongly do you agree or disagree that the following are risky when driving and may lead to a crash?	• Attend to pets
	• Adjust the settings of vehicle controls and driving assistance systems (cruise control, mirrors, etc.)
	• Adjust the settings of vehicle comfort features (AC, windows, seat warmers, etc.)
	• Look at fixed external objects (e.g., advertisement billboards)
	• Focus on incidents on the road (e.g., crash scene)
	• Daydream, get lost in thoughts
	• Sing, dance, or react to music
Compensatory beliefs for distracted driving	• Slowing down can compensate for the impacts of driving distractions.
How strongly do you agree or disagree with the following when driving?	• An experienced driver can compensate for the impacts of driving distractions.
	• It is ok to be distracted if traffic condition looks safe.
	• Using voice function of technological devices is not distracting.
	• Looking at the roadway to monitor for hazards can compensate for the impacts of driving distractions.
	• Driving a car with a high safety rating can compensate the risk of distracted driving.

4.2. Questionnaire

The questionnaire was designed into three sections including demographic and background information, beliefs and behaviours related to distractions, and perceptions of distracted driving road rules. Further details of each section are provided in the following subsections.

4.2.1. Demographics and background questions

The first section of the questionnaire focused on demographics and background information related to distracted driving. Participants were asked about their age, licence type, gender, weekly driving hours, type of vehicle, the level of technology in vehicle, familiarity with distracted driving, past crash history (including whether the crash was related to distraction), and past fines (including whether the fine was issued due to distracted driving). Familiarity with distracted driving was assessed by first providing participants with a definition of distracted driving (i.e., 'anything that takes a driver's attention away from the primary task of driving') and then asking them to rate their familiarity, ranging from not to somewhat familiar to definitely familiar. For past crashes and fines, participants were asked: "*During the past three years, how many crashes have you been involved in as a driver, and was at least one of them related to distracted driving?*" and "*During the past three years, on how many occasions have you lost demerit points or been fined for a traffic offence, and was at least one of these related to distracted driving*?"

4.2.2. Beliefs and behaviours regarding distractions

In the second section, an expanded version of the Susceptibility to Distracted Driving Questionnaire (Feng et al., 2014) was developed to investigate drivers' beliefs and behaviours regarding various sources of driver distraction (see Table 1). Distracted driving beliefs refer to the perceptions that drivers hold about distracted driving, which includes their attitudes toward distractions, perceived risk of distractions, social norms regarding distractions, perceived control of distractions, and their perceptions of compensatory beliefs regarding distractions. In addition, distracted driving behaviours (i.e., engagement in distraction sources) refers to the extent to which drivers participate in or use different sources of distractions while driving. For each scale (i.e., engagement, attitudes, perceived risk, perceived control, social norms), participants evaluated 16 sources of distraction, comprising eight technological and eight non-technological distractions, using a 7-point Likert scale (1 = *Never/Strongly Disagree*, 7 = *Always/Strongly Agree*). Additionally, drivers' perceptions of compensatory beliefs regarding distractions were measured with a six-item scale, using the same 7-point Likert response scale to rate agreement.

4.2.3. Perceptions of distracted driving road rules

By using the Value-Belief-Norm theory with policy-specific perceptions (Eriksson et al., 2006), the third section aimed to assess drivers' perceptions of distracted driving road rules (i.e., the prohibition of hand-held mobile phone use while driving). Perceptions of road rules refer to how drivers consider and perceive the level of effectiveness, freedom, fairness, and complexity of current distracted driving legislation. Before answering the questions, participants were provided with a summary of the current road rules (see Appendix; Table A2). They then responded to items measuring perceived effectiveness, perceived freedom, perceived fairness, and perceived complexity (see Table 2). Responses were recorded using a 7-point Likert scale (1 = *Strongly Disagree*, 7 = *Strongly Agree*). Following these quantitative measures, participants answered three open-ended questions regarding the effectiveness of current rules ("*How effective do you believe the current rules are?*"), their coverage ("*To what extent do the current rules sufficiently address distracted driving? Why?*"), and their clarity ("*What do you think about the clarity and understandability of the current rules?*"). Subsequently, participants were asked a binary question about whether more comprehensive rules for distracted driving are needed. Those who answered "*yes*" were then prompted with an additional open-ended question, asking them to specify which sources of distraction they believe should be included in future regulations.

Table 2
Questionnaire items for perceptions of distracted driving road rules.

Factors	Questions
Perceived Effectiveness	• I believe the current rules would be effective in reducing distracted driving. • I believe the current rules would be effective in reducing distracted driving crashes. • I believe the current rules would be effective in improving road safety.
Perceived Fairness	• I believe the current rules would be a fair policy for me. • I believe the current rules would be a fair policy for other drivers. • I find the current rules to be an equitable policy for drivers.
Perceived Freedom	• I believe the current rules would prevent me from driving the way I want to. • I believe the current rules would be a threat to my personal freedom. • I believe the current rules would make my daily trips more difficult.
Perceived Complexity	• I believe the current rules would be complex. • I believe the current rules would be difficult to understand. • I believe the current rules would be hard to follow.

4.3. Participants

A total of 547 participants initiated the online questionnaire. After excluding 53 responses due to incomplete or invalid answers, the final dataset comprised 494 participants. Table 3 presents the sample characteristics, including demographic details and background information.

4.4. Data analysis

To address RQ1, descriptive analysis was conducted to examine participants' beliefs and behaviours regarding technological and non-technological distractions. A paired-samples t-test was used to identify any differences in beliefs and behaviours between these two forms of distractions. To investigate any differences in beliefs and behaviours across demographics and background characteristics, multiple independent-samples *t*-tests and one-way ANOVA tests were conducted. Additionally, cross-tabulations were conducted to examine differences in engagement with distraction sources while driving across age, gender, and licence type groups.

To answer RQ2, drivers' perceptions of current distracted driving rules were examined using both quantitative and qualitative approaches. First, descriptive analysis, along with multiple independent-sample *t*-tests and ANOVA tests, were conducted to explore the level of effectiveness, fairness, freedom, and complexity of rules, as well as to identify differences in these perceptions across demographic and background variables. Second, the qualitative analysis examined responses to open-ended questions regarding the effectiveness, coverage, and clarity of current rules. The qualitative component aimed to complement the quantitative findings by providing a deeper understanding of participants' views on distracted driving legislation, rather than to generalise results to a broader

Table 3
Participants demographic and background information.

Variable		Frequency	Percentage
Age		Mean = 39.27 years, SD = 15.10	
Gender	*Male*	245	49.6%
	Female	249	50.4%
Licence type	*Open Licence*	350	70.9%
	Provisional	43	8.7%
	Learner	25	5.1%
	International licence valid in Australia	76	15.4%
Driving experience		Mean = 19.06 years, SD = 15.94	
Weekly driving hours	*Less than 5 h per week*	119	24.1%
	6–10 h per week	174	35.2%
	11–20 h per week	144	29.1%
	21–30 h per week	42	8.5%
	More than 30 h per week	15	3.5%
Type of vehicle	*Conventional non-electric or non-hybrid vehicle*	361	73.1%
	Electric vehicle	33	6.2%
	Hybrid car	100	20.2%
Level of vehicle technology *	*Basic technology*	58	11.7%
	Moderate technology	229	46.4%
	Advanced technology	188	38.1%
	Highly advanced technology	19	3.8%
Familiarity with distracted driving	*Definitely familiar*	268	54.3%
	Not familiar to Somewhat familiar	226	45.7%
Previous crash in the last 3 years	*Yes*	140	28.3%
	No	354	71.7%
Previous distracted driving crash in the last 3 years	*Yes*	66	13.4%
	No	428	86.6%
Previous infringement in the last 3 years	*Yes*	178	36.0%
	No	316	64.0%
Previous distracted driving infringement in the last 3 years	*Yes*	46	9.3%
	No	448	90.7%

Note: Basic technology: standard radio and manual controls such as windows and lock; Moderate technology: Bluetooth connectivity, a basic infotainment system or touchscreen, cruise control; Advanced technology: adaptive cruise control, lane-keeping assist, automatic emergency braking; Highly advanced technology: advanced driver monitoring, artificial intelligence integration, autonomous driving capabilities.

population (Opdenakker, 2006). An initial cycle of coding guided by sentiment analysis was conducted by the first author to categorise responses based on participants' expressed views on road rules (Pang & Lee, 2008). The identified codes were reviewed in terms of frequency, elaboration, and extensiveness by the research team to provide a comprehensive understanding of drivers' perceptions of the current legislation. This process ensured that the findings aligned with the study's objectives and accurately reflected participants' perspectives, therefore supporting the validity of the research (Pyett, 2003). All quotes provided are cited by the quoted participant's gender and age in years (e.g., female, 52).

To address RQ3 and further examine the relationship between distracted driving beliefs and behaviours, and drivers' views on road rules, four hierarchical regressions were conducted to predict perceptions of effectiveness, freedom, fairness, and complexity of rules. Hierarchical regression was selected for the analysis due to the ability to assess the explanatory power of different predictor groups using observed variables (prediction), rather than to test a latent-variable model (model testing). This approach provided a framework for examining how each set of predictors contributed to explaining variance in drivers' perceptions of distracted driving rules. Further, given the available sample size, hierarchical regression provided a more statistically robust approach compared to other statistical models. In step one, demographic and background variables were included. In step two, drivers' beliefs and behaviours regarding technological distractions were added to the model. Finally, in step three, drivers' beliefs and behaviours regarding non-technological distractions were included.

To answer RQ4, a binary logistic regression was conducted to assess whether drivers perceive a need for more comprehensive distracted driving rules and to explore potential relationships between their perceptions of current legislation and the perceived need for enhanced legislation.

5. Results

5.1. Distracted driving beliefs and behaviours

5.1.1. Beliefs and behaviours regarding technological and non-technological distractions

A descriptive analysis was conducted to describe drivers' beliefs and behaviours regarding distracted driving. The results showed that the mean engagement for both technological distractions (M = 2.97, SD = 0.90) and non-technological distractions (M = 2.96, SD = 1.02) were slightly below the midpoint. The results of paired-sample *t*-test revealed that there was no significant difference between engagement with technological and non-technological distractions $t_{(492)} = 0.36$, $p = 0.71$, d = 0.01. For technological distractions, the average engagement rating for listening to or adjusting vehicle audio system or personal music entertainment was the highest (M = 4.01, SD = 1.64), followed by looking at or using display monitors, navigation systems, or communication devices (M = 3.81, SD = 1.56), and adjusting the settings of vehicle comfort features (M = 3.63, SD = 1.45). For non-technological distractions, the average

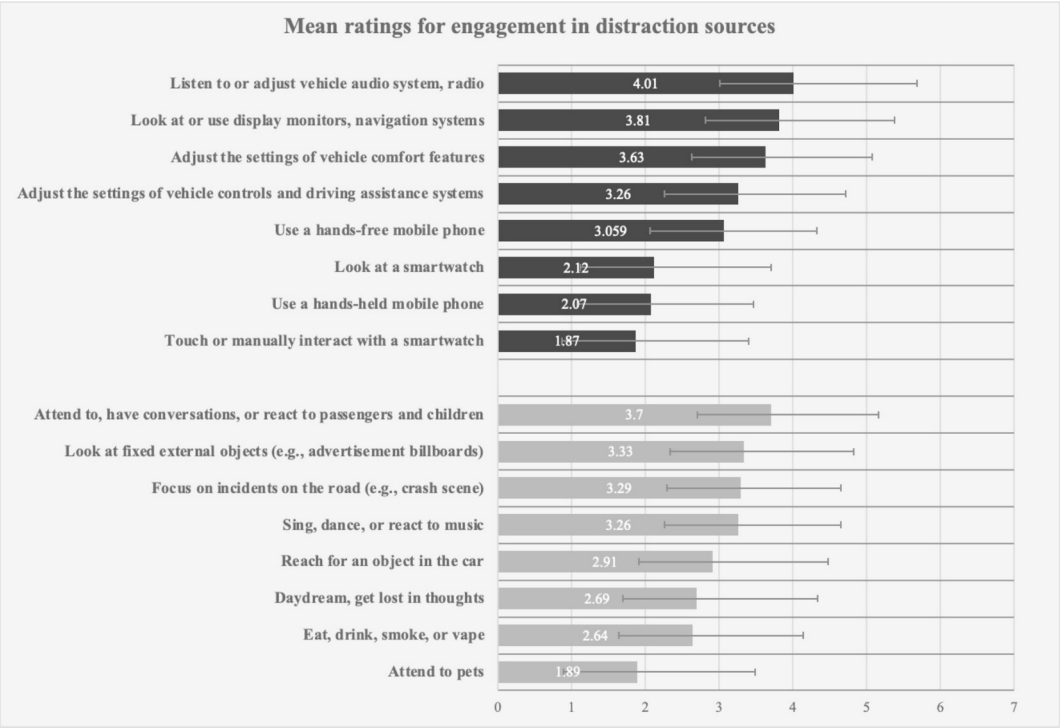

Fig. 1. Mean ratings for self-reported engagement with distraction sources (from 1 to 7).

engagement rating for interacting with passengers and children was the highest (M = 3.70, SD = 1.53), followed by looking at fixed external objects such advertisement billboards (M = 3.33, SD = 1.45), and focusing on incidents on the road (M = 3.29, SD = 1.44). Fig. 1 presents the mean engagement ratings for both technological and non-technological distraction sources.

The results also revealed a moderate level of favourable attitude toward engaging with distractions while driving. The findings showed a significant higher favourable attitude toward engaging with technological distractions (M = 3.67, SD = 1.02) compared to non-technological distractions (M = 3.53, SD = 1.18) $t_{(492)} = 4.10$, $p < 0.01$, d = 0.18. Regarding perceived risk, the results indicated that participants reported a perceived risk level above the midpoint for engaging with distractions. Notably, the perceived risk was significantly higher for non-technological distractions (M = 4.65, SD = 1.23) compared to technological distractions (M = 4.49, SD = 1.09) $t_{(492)} = 4.55$, $p < 0.001$, d = 0.20. The results also revealed that participants reported a moderate level of control over distractions while driving. The perceived control was significantly higher for technological distractions (M = 3.73, SD = 1.13) compared to non-technological distractions (M = 3.45, SD = 1.19) $t_{(492)} = 8.18$, $p < 0.001$, d = 0.36. The findings also showed that participants, on average, perceived that other drivers frequently engage in distractions. In particular, the perceived social norms surrounding engagement with technological distractions (M = 4.50, SD = 1.28) were significantly higher compared to non-technological distractions (M = 4.38, SD = 1.46) $t_{(492)} = 3.45$, $p < 0.001$, d = 0.16. The descriptive analysis also indicated that drivers moderately perceive compensatory actions while driving to mitigate the risks associated with distractions (M = 3.58, SD = 1.18). Table 4 presents the detailed descriptive results for distracted driving beliefs and behaviours across distraction sources.

5.1.2. Differences in beliefs and behaviours across individual groups

To test the relationship between demographic and background information and distracted driving beliefs and behaviours, multiple independent sample t-tests and ANOVA tests were conducted (see Table 5).

The results showed that a significant higher level of favourable attitudes toward technological distractions was reported by open licence ($N = 350$, M = 3.78, SD = 0.86) and provisional licence holders (N = 43, M = 3.77, SD = 1.12) compared to learners ($N = 23$, M = 3.02, SD = 1.14) and international licence holders ($N = 76$, M = 3.34, SD = 1.08) $F_{(3,490)} = 7.56$, $p < 001$, $\eta^2 = 0.05$. Further, participants who reported complete familiarity with distracted driving (N = 268, M = 2.88, SD = 0.89) reported significantly lower favourable attitudes compared to those with none or only some prior knowledge (N = 226, M = 3.08, SD = 0.90) $t_{(492)} = -4.20$, $p < 0.01$, d = 0.21. The results for attitudes toward non-technological distractions revealed a significant gender difference. Females (N = 249, M = 3.09, SD = 0.96) significantly reported a higher favourable attitude toward non-technological distractions compared to males (N = 245, M = 2.83, SD = 1.06) $t_{(492)} = 2.79$, $p < 0.01$, d = 0.25. Further, participants who were completely familiar with distracted driving ($N = 268$, M = 3.18, SD = 1.04) reported a significantly lower favourable attitude about non-technological distractions compared to those with no or some prior knowledge ($N = 226$, M = 2.77, SD = 0.96) $t_{(492)} = -4.51$, $p < 0.001$, d = 0.40.

Regarding the perceived control of engaging with technological distractions, a significant higher level of control was reported by full licence ($N = 350$, M = 3.77, SD = 1.06), provisional licence ($N = 42$, M = 3.81, SD = 1.20), and international licence holders ($N = 76$, M = 3.72, SD = 1.36) compared to learners ($N = 25$, M = 3.05, SD = 1.12) $F_{(3,490)} = 3.26$, $p < 05$, $\eta^2 = 0.02$. Further, those with at least one infringement in the past three years, regardless of whether it was related to distraction ($N = 178$, M = 3.94, SD = 1.08) reported a significant higher level of perceived control in comparison with those with no previous infringement record ($N = 316$, M = 3.61, SD = 1.15) $t_{(492)} = 3.14$, $p < 0.01$, d = 0.29. These results of group differences were also consistent for perceived control regarding engaging with non-technological distractions.

Regarding the perceived risk of technological distractions, a significant higher level of risk for engaging with technological

Table 4
Mean (and SD) for engagement and beliefs regarding distractions sources.

Technological	Engagement	Attitudes	Perceived risk	Perceived control	Social norms
Use a hands-free mobile phone	3.05 (1.59)	3.88 (1.82)	4.56 (1.78)	3.87 (1.85)	4.42 (1.65)
Use a hands-held mobile phone	2.07 (1.50)	2.20 (1.55)	3.69 (1.78)	2.40 (1.65)	5.39 (1.81)
Listen to or adjust vehicle audio system, radio, or personal music entertainment	4.01 (1.64)	4.47 (1.62)	4.96 (1.6)	4.57 (1.50)	3.87 (1.44)
Look at or use display monitors, navigation systems, or communication devices	3.81 (1.56)	4.53 (1.56)	4.99 (1.53)	4.45 (1.53)	4.11 (1.49)
Look at a smartwatch	2.12 (1.38)	2.79 (1.47)	4.07 (1.73)	2.96 (1.64)	4.99 (1.67)
Touch or manually interact with a smartwatch	1.87 (1.35)	2.26 (1.41)	3.78 (1.76)	2.44 (1.54)	5.38 (1.75)
Adjust the settings of vehicle controls and driving assistance systems	3.26 (1.49)	4.59 (1.60)	4.93 (1.56)	4.54 (1.55)	3.94 (1.48)
Adjust the settings of vehicle comfort features	3.63 (1.45)	4.71 (1.60)	5.05 (1.55)	4.66 (1.62)	3.88 (1.58)
Non-Technological					
Attend to, have conversations, or react to passengers and children	3.70 (1.53)	4.45 (1.54)	4.87 (1.65)	4.07 (1.59)	4.20 (1.49)
Reach for an object in the car	2.91 (1.39)	3.41 (1.58)	4.36 (1.71)	3.33 (1.64)	4.82 (1.58)
Eat, drink, smoke, or vape	2.64 (1.58)	3.51 (1.79)	4.34 (1.89)	3.53 (1.75)	4.35 (1.64)
Attend to pets	1.89 (1.26)	2.87 (1.59)	3.88 (1.68)	2.87 (1.55)	4.98 (1.61)
Look at fixed external objects	3.33 (1.45)	3.97 (1.53)	4.54 (1.62)	3.72 (1.59)	4.59 (1.46)
Focus on incidents on the road	3.29 (1.44)	3.50 (1.50)	4.68 (1.80)	3.35 (1.50)	4.86 (1.56)
Daydream, get lost in thoughts	2.69 (1.56)	2.73 (1.55)	4.00 (1.92)	2.81 (1.61)	5.16 (1.80)
Sing, dance, or react to music	3.26 (1.67)	3.84 (1.71)	4.46 (1.67)	3.92 (1.71)	4.28 (1.59)

Note: Mean ranges between 1 and 7; The lightest to darkest: the lowest to highest mean score.

Table 5
Group differences for beliefs and behaviours regarding distracted driving.

	F-test			T-test			
	Age	Licence type	In-vehicle technology	Gender	Previous crash	Previous fines	Knowledge of distracted driving
Technological distractions							
Engagement	13.24***	4.30**	2.76*	1.49	1.94	4.21***	2.38*
Attitudes	0.40	7.56***	0.14	1.07	1.98*	2.10*	3.81***
Perceived control	0.02	3.26*	0.53	1.14	1.58	3.14**	2.08*
Perceived risk	1.76	3.06*	1.51	2.43*	0.68	1.27	1.00
Non-technological distractions							
Engagement	2.36	5.57***	1.41	2.79**	2.72**	2.11*	4.51***
Attitudes	0.39	13.32***	0.67	2.88**	2.40*	1.33	4.88***
Perceived control	0.27	2.73*	0.74	0.54	1.74	2.44*	2.96**
Perceived risk	4.40*	3.18*	0.87	1.65	1.96*	0.92	1.53

Note: *: $p < 0.05$, **: $p < 0.01$, ***: $p < 0.001$.

distractions was reported by full licence drivers ($N = 350$, M = 4.56, SD = 1.30) compared to international licence holders (N = 76, M = 4.19, SD = 1.30) $F_{(3,490)} = 3.06$, $p < 05$, $\eta^2 = 0.02$. Further, females ($N = 249$, M = 4.61, SD = 1.05) significantly reported a higher level of perceived risk compared to males ($N = 245$, M = 4.37, SD = 1.12) $t_{(492)} = 2.43$, $p < 0.05$, d = 0.21. Regarding the perceived risk of non-technological distractions, there was a significant difference across age groups, as young adults (from 17 to 30 years old) ($N = 170$, M = 4.46, SD = 1.27) significantly reported lower level of perceived risk compared to older drivers (more than 55 years old) ($N = 80$, M = 4.94, SD = 1.04) $F_{(2,491)} = 4.40$, $p < 05$, $\eta^2 = 0.02$. Further, those with previous crashes in the past three years ($N = 140$, M = 4.82, SD = 1.01) reported a significant higher level of perceived risk regarding non-technological distractions compare to those with no previous crash record ($N = 354$, M = 4.58, SD = 1.30) $t_{(492)} = 1.96$, $p < 0.05$, d = 0.19.

The results also revealed that a significant higher technological distraction engagement was reported by young adults (N = 170, M = 3.05, SD = 0.93) and middle-aged drivers (from 30 to 55 years old) ($N = 244$, M = 3.07, SD = 0.89) compared to older drivers (N = 80, M = 2.51, SD = 0.74) $F_{(2,491)} = 13.24$, $p < 001$, $\eta^2 = 0.05$. Further, open licence ($N = 350$, M = 2.94, SD = 0.84) and provisional licence holders ($N = 43$, M = 3.28, SD = 0.98) significantly reported a higher level of technological engagement compared to learners ($N = 25$, M = 2.50, SD = 1.09) and international licence holders ($N = 76$, M = 3.10, SD = 1.01) $F_{(3,490)} = 4.30$, $p < 01$, $\eta^2 = 0.03$. The results also showed that drivers who received at least one infringement in the past 3 years ($N = 178$, M = 3.20, SD = 0.87) significantly reported higher engagement compared to those with no infringement record ($N = 316$, M = 2.85, 0.90) $t_{(492)} = 4.21$, $p < 0.001$, d = 0.39. In addition, participants who were completely familiar with distracted driving ($N = 268$, M = 2.88, SD = 0.89) reported a significant lower level of engagement with technological distractions compared to those with no or some prior knowledge ($N = 226$, M = 3.08, SD = 0.90) $t_{(492)} = 2.38$, $p < 0.01$, d = 0.21.

Regarding the engagement with non-technological distractions, a significant higher engagement rating was reported by open licence (N = 350, M = 3.03, SD = 0.97) and provisional licence holders (N = 43, M = 3.20, SD = 1.22) compared to learners (N = 25, M = 2.20, SD = 1.15) and international licence holders (N = 76, M = 2.65, SD = 0.97) $F_{(3,490)} = 5.57$, $p < 001$, $\eta^2 = 0.03$. Females ($N = 249$, M = 3.09, SD = 0.96) also reported a higher level of engagement with non-technological distractions than males ($N = 245$, M = 2.83, SD = 1.06) $t_{(492)} = 2.79$, $p < 0.01$, d = 0.25. Further, participants who were completely familiar with distracted driving (N = 268, M = 2.77, SD = 0.96) reported a significant higher level of engagement with non-technological distractions compared to those with no or some prior knowledge (N = 226, M = 3.18, SD = 1.04) $t_{(492)} = 4.51$, $p < 0.001$, d = 0.40.

To further investigate group differences for engagement with distractions, a cross-tabulation across age, gender and licence type was conducted for each distraction source, and the results are presented in Table A1 (see Appendix).

Table 6
Group differences for perceptions of distracted driving road rules.

	F-test			T-test			
	Age	Licence type	In-vehicle technology	Gender	Previous crash	Previous fines	Knowledge of distracted driving
Perceived effectiveness	2.14	4.48**	0.98	1.11	1.46	1.74	1.39
Perceived fairness	3.31*	3.04*	3.30*	1.82	0.37	1.38	1.13
Perceived freedom	20.99***	18.90***	0.53	5.90***	4.40***	3.57***	1.49
Perceived complexity	4.26*	8.38***	1.46	4.03***	3.39***	0.63	2.58*

Note: *: $p < 0.05$, **: $p < 0.01$, ***: $p < 0.001$.

5.2. Perceptions of distracted driving road rules

5.2.1. Descriptive analysis of drivers' perceptions of distracted driving rules

A descriptive analysis was conducted to examine drivers' perceptions of current road rules in terms of effectiveness, fairness, freedom, and complexity. The results indicated that participants generally perceived the effectiveness of current distracted driving rules as slightly above the midpoint (M = 4.60, SD = 1.55). They also viewed the rules as generally fair (M = 5.46, SD = 1.19). In terms of complexity, participants considered the rules to be moderately complex (M = 3.37, SD = 1.53). Additionally, they perceived the rules as allowing them a level of freedom while driving (M = 5.07, SD = 1.48).

5.2.2. Differences in perceptions of rules across individual groups

The results of group differences are presented in Table 6. The results showed that a significant higher perceived effectiveness was reported by international driving licence holders ($N = 76$, M = 5.04, SD = 1.37) compared to open licence holders ($N = 350$, M = 4.44, SD = 1.58) $F_{(3,490)} = 4.48$, $p < 001$, $\eta^2 = 0.03$. However, opposite results were found for perceived fairness, where a significant lower level of perceived fairness was reported by international driving licence holders (N = 76, M = 5.14, SD = 1.18) compared to open licence holders ($N = 350$, M = 5.55, SD = 1.18) $F_{(3,490)} = 3.04$, $p < 05$, $\eta^2 = 0.02$. Further, a significant lower level of perceived fairness was reported by young adults ($N = 170$, M = 5.35, SD = 1.14) compared to older drivers ($N = 80$, M = 5.46, SD = 1.19) $F_{(2,491)} = 3.31$, $p < 05$, $\eta^2 = 0.01$. Also, those driving vehicles with highly advanced in-vehicle technologies ($N = 19$, M = 4.78, SD = 1.28) reported a significant lower level of perceived fairness compared to those with basic ($N = 58$, M = 5.73, SD = 0.99) or moderate in-vehicle technology ($N = 229$, M = 5.50, SD = 1.24) $F_{(3,490)} = 3.33$, $p < 05$, $\eta^2 = 0.02$.

Regarding the perceived freedom of current distracted driving road rules, a significant difference was found between age groups. Young adults ($N = 170$, M = 4.60, SD = 1.40) reported significantly lower perceived freedom compared to middle-aged drivers ($N = 244$, M = 5.14, SD = 1.48), who in turn, reported significantly lower perceived freedom than older drivers ($N = 80$, S.84, SD = 1.29) $F_{(2,491)} = 20.99$, $p < 001$, $\eta^2 = 0.08$. Additionally, provisional ($N = 43$, M = 4.23, SD = 1.38) and international licence holders ($N = 76$, M = 4.26, SD = 1.39) perceived significantly less freedom compared to open licence holders ($N = 350$, M = 5.37, SD = 1.40). Furthermore, a significant lower perceived freedom was reported by males ($N = 245$, M = 4.68, SD = 1.50) compared to females ($N = 249$, M = 5.45, SD = 1.36) $t_{(492)} = 5.90$, $p < 0.001$, d = 0.53, individuals who had been involved in a crash in the past three years ($N = 140$, M = 4.61, SD = 1.59) in comparison with those without crash history ($N = 354$, 5.25, SD = 1.39) $t_{(492)} = 4.40$, $p < 0.001$, d = 0.43, and those who had received a fine in the last three years ($N = 178$, M = 4.75, SD = 1.45) compared to their counterparts ($N = 316$, M = 5.25, SD = 1.47) $t_{(492)} = 3.57$, $p < 0.01$, d = 0.33.

Regarding perceived complexity, significantly higher levels were reported by young adults (N = 170, M = 3.62, SD = 1.55) compared to older drivers (N = 80, M = 3.37, SD = 1.53) $F_{(2,491)} = 4.26$, $p < 05$, $\eta^2 = 0.02$. Further, provisional (N = 43, M = 4.00, SD = 1.62) and international licence holders (N = 76, M = 3.89, SD = 1.59) significantly perceived current distracted driving rules to be complex compared to open licence holders (N = 350, 1.16, SD = 1.46) $F_{(3,490)} = 8.38$, $p < 001$, $\eta^2 = 0.05$. The results were also similar for males (N = 245, M = 3.65, SD = 1.56), as they reported a higher perceived complexity compared to females (N = 249, M = 3.10, SD = 1.46) $t_{(488.69)} = 4.03$, $p < 0.001$, d = 0.36. In additions, participants with lower prior knowledge of distracted driving ($N = 226$, M = 3.57, SD = 1.47) reported a lower level of perceived complexity compared to their respective counterparts ($N = 268$, M = 3.21, SD = 1.57) $t_{(492)} = 2.58$, $p < 0.01$, d = 0.23.

5.2.3. Open-ended responses

5.2.3.1. Effectiveness of rules. To further explore drivers' perceptions regarding effectiveness, coverage, and clarity of current distracted driving rules, a qualitative analysis was conducted. The review of the first open-ended question regarding the effectiveness of current rules in reducing distracted driving showed that 46.76% ($n = 231$) of participants responded to this question. The initial coding guided by sentiment analysis revealed three categories in responses: participants who perceived the rules are effective as they are, participants who recognise some effectiveness but provided suggestions for improvements, and participants who perceived the distracted driving rules as ineffective.

For the first category, 71 participants (30.7%) who responded to the question, considered the current distracted driving rules to be effective and sufficient in reducing distracted driving. They argued that current road rules were successful in distracted driving behaviours and crashes.

"They are pretty effective. Drivers seem much less likely to use their phones while at traffic lights or actually driving." (female, 52).

"The rules are effective. Imagine the crashes and loss of life we would have without these rules." (female, 51).

For the second category, 142 participants who responded to the question (61.47%,) considered the current distracted driving rules to be moderately effective in reducing distracted driving. However, they highlighted the need for improvements in various aspects and pointed out certain limitations. Many participants argued that the current rules failed to account for the effects of emerging technologies that may distract drivers, and do not keep pace with the evolution of in-vehicle technologies.

"I believe the rules to be effective, if not encompassing ALL of the technology types that may distract people (e.g., smart watches)." (male, 30).

"I believe they are a little out of date and could be updated to consider our constantly updating technologies that make distracted driving easier and more common." (female, 31).

Several participants also argued that the current road rules are not effective due to limitations in enforcement. They mentioned that

enforcement and legislation are complementary, and that enforcement could be improved.

"In my opinion, the current regulations are not sufficiently effective. While they clearly outline forbidden actions, such as using a handheld phone, there are still many drivers who continue to ignore these rules. Better enforcement and stricter penalties might be needed to truly deter people from engaging in distracted behaviour behind the wheel." (male, 22).

"I believe the current rules are moderately effective. They have raised public awareness about the risks of distracted driving and imposed penalties that have reduced some dangerous behaviours, like texting at the wheel. However, enforcement can be inconsistent, and there remain drivers who find ways around the rules." (female, 23).

A few participants also highlighted the role of education, suggesting that the effectiveness of current road rules could be enhanced through further education and information for drivers.

Distracted driving laws work kind of well, but drivers need more education on what counts as distractions. (male, 29).

A few participants also argued that the current rules are not fully effective and need improvement, as they are vague about certain forms of distraction.

"Current rules are too vague to cover all forms of distraction, like hands-free tech." (male, 36).

For the third category, 18 participants (7.79%) who responded to the open-ended question considered the current distracted driving rules ineffective. They argued that the rules on mobile phones are unreasonable, as many other distractions are not regarded as equally dangerous.

"Not [effective] at all really. You can be just as distracted by hands-free calls, or the in-car display and apps (such as Apple-play). Also, I don't see why you can't use your phone when you're stopped at the traffic lights." (female, 54).

5.2.3.2. Coverage of rules. The review of the second open-ended question on the extent of coverage of current rules showed that 45.14% ($n = 223$) of participants provided a response. The coding, guided by sentiment analysis, revealed two categories of responses: participants who considered the rules sufficient to cover distracted driving and those who recognised limitations in the extent to which the current rules cover distracted driving.

For the first category, 30.49% ($n = 68$) of participants who responded to the question considered the current distracted driving rules sufficient. They reported that mobile phones are the biggest distraction and that the existing rules addressing phones are adequate, given that other distractions are more difficult to identify and enforce.

"Mobile phones are the biggest distraction so having rules around this is vital. Other distractions are less easily policed. I think they cover most of what needs to be covered." (male, 54).

In the second category, most participants who responded to this question (69.50%, $n = 155$) identified several limitations in the coverage of current road rules. Many of these participants reported that while mobile phones are addressed in the rules, less obvious distractions have been overlooked. Additionally, some participants noted that the current road rules have weak adaptability to evolving technology, particularly the distracting role of in-car infotainment systems.

"I think the current rules only partially cover distracted driving. While they address electronic device use, they don't always account for less obvious distractions, like adjusting GPS settings or talking to passengers. Given how quickly technology and driving habits evolve, the rules might require frequent updates to stay relevant." (male, 22).

"The rule has a weaker adaptability to modern technology, failing to fully cover the use of in-car systems." (female, 32).

5.2.3.3. Clarity of rules. The results of the third open-ended question on the clarity and existence of grey areas in the current road rules showed that 42.30% ($n = 209$) of participants provided a response. The coding revealed two categories of responses: participants who believed the road rules are clear and free of ambiguity or grey areas, and those who identified vague aspects and a lack of clarity in how the current rules address distracted driving.

For the first category, 37.79% ($n = 79$) of participants who responded to the question considered the current distracted driving rules clear and free of ambiguities. They reported that the rules on mobile phones are well-established and that any perceived potential ambiguities stem from a lack of awareness about the rules rather than issues with the rules themselves.

"The rules for distracted driving are well-established and easy to understand." (male, 18).

In the second category, many participants who responded to this question (56.76%, $n = 130$) identified several grey areas and ambiguities in the current road rules. Several respondents expressed confusion about the use of hands-free devices or vehicle touchscreens. Some participants also noted that the current rules do not explicitly define distracted driving, which can lead to misinterpretations or misunderstandings. Additionally, some participants highlighted uncertainties regarding what constitutes acceptable hands-free phone use, particularly when using navigation apps and how much interaction with the phone is permitted.

"Overall, the rules are reasonably clear and understandable, especially regarding phone usage. However, there are grey areas when it comes to specific activities, like using hands-free devices or certain vehicle touchscreens. Clarifying these exceptions would help both law enforcement and drivers understand exactly what is and isn't allowed." (female 23).

"The current rules do not clearly define distracted driving, which can lead to misunderstandings." (male, 23).

"I find the rules a bit vague in certain scenarios, which can cause confusion. For example, it's unclear whether quickly checking a navigation app is considered a violation if the driver is touching the phone for some moments. These grey areas can be resolved by more detailed guidelines or examples to illustrate acceptable versus unacceptable behaviours." (male, 32).

5.2.4. Relationships between distracted driving beliefs and behaviours, and perceptions of road rules

Four multiple hierarchical regression were conducted to examine how participants' background information and distracted driving

beliefs and behaviours influence perceptions of road rules. The results of the first hierarchical regression model to explain the level of perceived effectiveness of current distracted driving rules are presented in Table 7. The results of step 1 (demographics and background variables only) revealed that the model significantly explained 20% of the variance in perceived effectiveness. Licence type was significantly associated with perceived effectiveness of road rules, with international licence holders reporting higher perceived effectiveness compared to open licence holders ($\beta = 0.136$, $p = 0.005$). In step 2, after the inclusion of beliefs and behaviours regarding technological distractions, the variance explained by the model increased to 33% (R^2 change = 0.13). The results of this step showed that, in addition to licence type, engagement with technological distractions ($\beta = -0.110$, $p = 0.053$) and level of social norms regarding technological distractions ($\beta = -0.264$, $p = 0.001$) were negatively associated with perceived effectiveness of rules. Participants who reported higher levels of engagement with technological distractions and perceived greater engagement by others perceived the rules as less effective. Further, perceived risk of distractions ($\beta = 0.134$, $p = 0.001$) and compensatory beliefs regarding technological distractions ($\beta = 0.221$, $p = 0.001$) were positively associated with the level of perceived effectiveness of rules. In step 3, after including beliefs and behaviours regarding non-technological distractions, the variance explained by the model increased to 45% (R^2 change = 0.12). The results of this step revealed that engagement with non-technological distractions ($\beta = -0.259$, $p = 0.001$) and favourable attitudes toward both technological ($\beta = -0.284$, $p = 0.002$) and non-technological ($\beta = -0.283$, $p = 0.003$) distractions were negatively associated with the perceived effectiveness of rules. Further, perceived risk ($\beta = 0.235$, $p = 0.002$) and compensatory beliefs ($\beta = 0.165$, $p = 0.001$) were found to be positive predictors of perceived effectiveness.

The second hierarchical regression model explained the level of perceived fairness of the current distracted driving legislation, and the results are shown in Table 8. The results of step 1 revealed that the model significantly explained 19% of the variance in perceived fairness. Licence type was significantly associated with perceived fairness, with international licence holders reporting lower perceived fairness compared to open licence holders ($\beta = -0.108$, $p = 0.025$). In step 2, the model explained 34% of variance in perceived fairness (R^2 change = 0.15). The results of this step showed that engagement with technological distractions ($\beta = -0.181$, $p = 0.025$) and compensatory beliefs ($\beta = -0.211$, $p = 0.001$) were negative predictors of perceived fairness. Meanwhile, favourable attitudes toward technological distractions ($\beta = 0.251$, $p = 0.001$) and perceived risk of technological distractions ($\beta = 0.134$, $p = 0.004$) were positively associated with perceived fairness. In step 3, the model explained 39% of variance in perceived fairness (R^2 change = 0.05). The results revealed that engagement with technological distractions ($\beta = -0.195$, $p = 0.007$), favourable attitudes toward non-technological distractions ($\beta = -0.385$, $p = 0.001$), and compensatory beliefs ($\beta = -0.215$, $p = 0.001$) were positive predictors of perceived fairness. Also, attitudes toward technological distractions ($\beta = 0.485$, $p = 0.001$), perceived risk of technological distractions ($\beta = 0.183$, $p = 0.017$), and perceived control over engaging with non-technological distractions ($\beta = 0.249$, $p = 0.013$) were negative predictors of perceived fairness.

Regarding the perceived freedom of the current distracted driving rules, the results of hierarchical regression model are shown in Table 9. The model successfully explained 46% of the variance in perceived freedom in step 1. Gender, licence type, age, and previous crashes and fines were significant predictors of participants' level of perceived freedom. According to the results, females ($\beta = 0.202$, $p = 0.001$) reported a higher level of perceived freedom. Further, provisional ($\beta = -0.117$, $p = 0.012$) and international licence holders ($\beta = -0.218$, $p = 0.001$) reported a lower level of perceived freedom compared to open licence holders. Young adults ($\beta = -0.227$, $p = 0.001$) and middle-aged drivers ($\beta = -0.187$, $p = 0.001$) also reported a lower level of freedom compared to older drivers. Drivers who had previous crashes ($\beta = -0.140$, $p = 0.001$) and fines ($\beta = -0.086$, $p = 0.043$) also reported a lower level of perceived freedom. In step 2, the model significantly explained 53% of variance in perceived freedom (R^2 change = 0.07). The results showed that, in addition to the factors from step 1, perceived control over technological distractions ($\beta = -0.087$, $p = 0.040$) and compensatory beliefs ($\beta = -0.234$, $p = 0.001$) were negative predictors of perceived freedom, while social norms were a positive predictor ($\beta = 0.203$, $p = 0.001$). In the final step, the model successfully explained 55% of variance in perceived freedom (R^2 change = 0.02). The results revealed that, in addition to the significant demographic and background factors explaining perceived freedom, compensatory beliefs ($\beta = -0.216$, $p = 0.001$) and perceived control over non-technological distractions ($\beta = -0.255$, $p = 0.005$) negatively predicted perceived freedom.

Regarding the perceived complexity of road rules, the model explained 32% of the variance in step 1 (see Table 10). Gender, licence type, familiarity with distracted driving, and previous crashes were significant predictors of perceived complexity. According to the results, females ($\beta = -0.156$, $p = 0.001$) reported a lower level of perceived complexity. Further, learners ($\beta = 0.093$, $p = 0.045$), provisional ($\beta = 0.105$, $p = 0.035$) and international licence holders ($\beta = 0.167$, $p = 0.001$) reported a higher level of perceived complexity compared to open licence holders. The results also showed that those who were completely familiar with distracted driving ($\beta = -0.119$, $p = 0.006$) reported a lower level of perceived complexity. Additionally, those with previous crashes ($\beta = -0.034$, $p = 0.003$) reported a higher level of perceived complexity of distracted driving rules. In step 2, the model explained 40% of variance in perceived complexity (R^2 change = 0.08). The results showed that in addition to gender, licence type, familiarity with distracted driving, and previous crashes, compensatory beliefs were a significant positive predictor of perceived complexity ($\beta = 0.214$, $p = 0.001$). In the last step, the model successfully explained 45% of the variance in perceived complexity (R^2 change = 0.05). In addition to demographic and background factors, social norms regarding technological distractions ($\beta = -0.332$, $p = 0.001$) were a negative predictor, while compensatory beliefs ($\beta = 0.186$, $p = 0.001$), perceived risk of non-technological distractions ($\beta = 0.193$, $p = 0.009$), and social norms regarding non-technological distractions ($\beta = 0.253$, $p = 0.018$) were significant positive predictors.

5.3. *Drivers' perceived need for more comprehensive legislation*

Based on the results, 66.59% of participants ($n = 329$) reported that more comprehensive distracted driving legislation is necessary. The logistic regression analysis model to examine whether perceptions of the effectiveness, fairness, freedom, and complexity of

Table 7
Hierarchical regression analysis for predictors of perceived effectiveness.

Variables	B	SE	β	p	R^2	B	SE	β	p	R^2	R^2 change	B	SE	β	p	R^2	R^2 change
Step 1					0.20	**Step 2**				0.33	0.13	**Step 3**				0.45	0.12
Constant	4.484	0.212	–	0.001		3.583	0.469	–	0.001			3.755	0.448	–	0.001		
Gender																	
If female	−0.081	0.142	−0.026	0.569		−0.066	0.142	−0.021	0.642			0.087	0.137	0.028	0.528		
Licence type																	
If learner	0.474	0.341	0.067	0.165		0.378	0.340	0.053	0.266			0.225	0.327	0.032	0.492		
If provisional	0.477	0.284	0.086	0.093		0.457	0.279	0.083	0.102			0.496	0.267	0.090	0.064		
If international licence	0.588	0.208	0.136	**0.005**		0.427	0.216	0.099	**0.049**			0.240	0.210	0.055	0.254		
Age																	
if young adults	−0.209	0.235	−0.064	0.375		−0.184	0.234	−0.056	0.432			−0.306	0.226	−0.093	0.178		
if middle-aged	−0.295	0.201	−0.095	0.143		−0.212	0.201	−0.068	0.294			−0.315	0.194	−0.101	0.104		
Familiarity with distracted driving																	
if definitely familiar	0.186	0.140	0.059	0.184		0.237	0.138	0.076	0.086			−0.080	0.133	0.026	0.547		
Previous crash																	
if yes	0.125	0.162	0.036	0.439		0.094	0.158	0.027	0.552			0.213	0.152	0.061	0.162		
Previous fine																	
if yes	0.243	0.152	0.075	0.111		0.207	0.150	0.064	0.170			0.174	0.143	0.053	0.226		
Technological distractions																	
Engagement						−0.190	0.098	−0.110	**0.053**			−0.096	0.121	−0.056	0.430		
Attitudes						−0.165	0.107	0.109	0.122			−0.430	0.139	−0.284	**0.002**		
Perceived risk						0.192	0.067	0.134	**0.004**			0.335	0.105	0.235	**0.002**		
Perceived control						0.097	0.087	0.071	0.268			−0.036	0.127	−0.026	0.777		
Social norms						−0.264	0.067	−0.218	**0.001**			−0.036	0.123	−0.030	0.770		
Compensatory beliefs						0.221	0.067	0.168	**0.001**			0.218	0.066	0.165	**0.001**		
Non-Technological distractions																	
Engagement												−0.394	0.112	−0.259	**0.001**		
Attitudes												−0.374	0.127	−0.283	**0.003**		
Perceived risk												−0.132	0.093	−0.104	0.157		
Perceived control												0.202	0.126	0.155	0.108		
Social norms												−0.148	0.114	−0.139	0.196		

Table 8
Hierarchical regression analysis for predictors of perceived fairness.

Variables	B	SE	β	p	R^2	B	SE	β	p	R^2	R^2 change	B	SE	β	p	R^2	R^2 change
Step 1					0.19	**Step 2**				0.34	0.15	**Step 3**				0.39	0.05
Constant	5.631	0.163	–	0.001		5.028	0.357	–	0.001			5.045	0.353	–	0.001		
Gender																	
If female	0.174	0.109	0.073	0.111		0.135	0.108	0.057	0.211			0.173	0.108	0.073	0.110		
Licence type																	
If learner	−0.354	0.261	−0.065	0.175		−0.182	0.259	−0.034	0.482			−0.267	0.258	−0.049	0.300		
If provisional	0.025	0.217	0.006	0.908		0.218	0.212	0.052	0.304			0.264	0.210	0.063	0.209		
If international licence	−0.357	0.159	−0.108	**0.025**		−0.052	0.165	−0.016	0.753			−0.132	0.166	−0.040	0.426		
Age																	
if young adults	−0.254	0.180	−0.102	0.158		−0.247	0.178	−0.099	0.167			−0.326	0.178	−0.130	0.068		
if middle-aged	−0.264	0.154	−0.111	0.087		−0.188	0.153	−0.079	0.222			−0.261	0.152	−0.110	0.088		
Familiarity with distracted driving																	
if definitely familiar	0.133	0.107	0.056	0.215		0.151	0.105	0.063	0.150			0.113	0.105	0.047	0.283		
Previous crash																	
if yes	−0.005	0.124	−0.002	0.970		−0.017	0.120	−0.007	0.884			0.004	0.120	0.001	0.974		
Previous fine																	
if yes	−0.097	0.116	−0.039	0.405		−0.006	0.115	−0.003	0.955			−0.020	0.113	−0.008	0.857		
Technological distractions																	
Engagement						−0.237	0.075	−0.181	**0.002**			−0.257	0.095	−0.195	**0.007**		
Attitudes						0.290	0.081	0.251	**0.001**			0.561	0.109	0.485	**0.001**		
Perceived risk						0.187	0.051	0.172	**0.001**			0.199	0.083	0.183	**0.017**		
Perceived control						0.036	0.066	0.034	0.592			−0.146	0.100	−0.139	0.147		
Social norms						−0.023	0.051	−0.025	0.648			0.089	0.097	0.097	0.357		
Compensatory beliefs						−0.212	0.051	−0.211	**0.001**			−0.216	0.052	−0.215	**0.001**		
Non-Technological distractions																	
Engagement												0.080	0.088	0.069	0.362		
Attitudes												−0.388	0.100	−0.385	**0.001**		
Perceived risk												0.006	0.073	0.006	0.932		
Perceived control												0.248	0.099	0.249	**0.013**		
Social norms												−0.113	0.090	−0.140	0.207		

Table 9
Hierarchical regression analysis for predictors of perceived freedom.

Variables	B	SE	β	p	R^2	B	SE	β	p	R^2	R^2 change	B	SE	β	p	R^2	R^2 change
Step 1					0.46	**Step 2**				0.53	0.07	**Step 3**				0.55	0.02
Constant	5.619	0.183	–	0.001		6.445	0.399	–	0.001			6.452	0.400	–	0.001		
Gender																	
If female	0.598	0.123	0.202	**0.001**		0.577	0.121	0.195	**0.001**			0.563	0.123	0.190	**0.001**		
Licence type																	
If learner	−0.369	0.294	−0.055	0.209		−0.206	0.290	−0.030	0.477			−0.207	0.292	−0.031	0.477		
If provisional	−0.614	0.245	−0.117	**0.012**		−0.489	0.237	−0.093	**0.040**			−0.558	0.238	−0.106	**0.019**		
If international licence	−0.893	0.179	−0.218	**0.001**		−0.604	0.184	−0.147	**0.001**			−0.597	0.188	−0.144	**0.002**		
Age																	
if young adults	−0.708	0.203	−0.227	**0.001**		−0.708	0.199	−0.227	**0.001**			−0.648	0.202	−0.208	**0.001**		
if middle-aged	−0.555	0.173	−0.187	**0.001**		−0.563	0.172	−0.190	**0.001**			−0.542	0.173	−0.183	**0.002**		
Familiarity with distracted driving																	
if definitely familiar	0.196	0.120	0.066	0.105		0.149	0.117	0.050	0.204			0.144	0.119	0.048	0.227		
Previous crash																	
if yes	−0.462	0.139	−0.140	**0.001**		−0.431	0.134	−0.131	**0.001**			−0.437	0.135	−0.133	**0.001**		
Previous fine																	
if yes	−0.266	0.131	−0.086	**0.043**		−0.181	0.128	−0.059	0.158			−0.173	0.128	−0.056	0.177		
Technological distractions																	
Engagement						−0.031	0.083	−0.019	0.708			−0.091	0.108	−0.056	0.399		
Attitudes						0.025	0.091	0.017	0.787			−0.093	0.124	−0.064	0.455		
Perceived risk						−0.117	0.057	−0.087	**0.040**			−0.046	0.094	−0.034	0.622		
Perceived control						−0.048	0.074	−0.037	0.519			0.195	0.114	0.149	0.087		
Social norms						0.203	0.057	0.176	**0.001**			0.169	0.109	0.147	0.124		
Compensatory beliefs						−0.304	0.057	−0.234	**0.001**			−0.271	0.059	−0.216	**0.001**		
Non-Technological distractions																	
Engagement												0.030	0.099	0.021	0.763		
Attitudes												0.164	0.113	0.131	0.147		
Perceived risk												−0.082	0.083	−0.069	0.320		
Perceived control												−0.317	0.112	−0.255	**0.005**		
Social norms												0.046	0.102	−0.045	0.654		

Table 10
Hierarchical regression analysis for predictors of perceived complexity.

Variables	B	SE	β	p	R^2	B	SE	β	p	R^2	R^2 change	B	SE	β	p	R^2	R^2 change
Step 1					0.32	**Step 2**				0.40	0.08	**Step 3**				0.45	0.05
Constant	3.394	0.202	–	0.001		2.150	0.448	–	0.001			2.035	0.441	–	0.001		
Gender																	
If female	−0.479	0.136	−0.156	**0.001**		−0.483	0.135	−0.157	**0.001**			−0.512	0.135	−0.166	**0.001**		
Licence type																	
If learner	0.654	0.325	0.093	**0.045**		0.554	0.325	0.079	0.089			0.577	0.322	0.082	0.074		
If provisional	0.572	0.271	0.105	**0.035**		0.461	0.267	0.085	0.085			0.522	0.262	0.096	**0.047**		
If international licence	0.713	0.198	0.167	**0.001**		0.487	0.207	0.114	**0.019**			0.530	0.207	0.124	**0.011**		
Age																	
if young adults	0.118	0.224	0.036	0.599		0.125	0.224	0.039	0.577			0.187	0.223	0.058	0.400		
if middle-aged	0.203	0.192	0.066	0.290		0.203	0.193	0.066	0.293			0.287	0.190	0.093	0.132		
Familiarity with distracted driving																	
if definitely familiar	−0.366	0.133	−0.119	**0.006**		−0.307	0.132	−0.100	**0.020**			−0.233	0.131	−0.76	0.075		
Previous crash																	
if yes	0.461	0.154	0.135	**0.003**		0.415	0.151	0.122	**0.006**			0.356	0.149	0.104	**0.018**		
Previous fine																	
if yes	−0.107	0.145	−0.034	0.460		−0.202	0.144	−0.063	0.161			−0.186	0.141	−0.058	0.187		
Technological distractions																	
Engagement						0.096	0.094	0.057	0.304			0.105	0.119	0.062	0.380		
Attitudes						−0.089	0.102	−0.059	0.387			−0.075	0.137	−0.050	0.582		
Perceived risk						0.121	0.064	0.086	0.061			−0.114	0.104	−0.081	0.271		
Perceived control						0.073	0.083	0.054	0.382			−0.071	0.125	−0.053	0.569		
Social norms						−0.103	0.064	−0.087	0.106			−0.396	0.121	−0.332	**0.001**		
Compensatory beliefs						0.278	0.064	0.214	**0.001**			0.242	0.065	0.186	**0.001**		
Non-Technological distractions																	
Engagement												0.054	0.110	0.039	0.620		
Attitudes												−0.024	0.125	−0.019	0.845		
Perceived risk												0.241	0.091	0.193	**0.009**		
Perceived control												0.184	0.124	0.143	0.138		
Social norms												0.266	0.112	0.253	**0.018**		

current rules, and background information, were associated with participants' views on the necessity of enhanced legislation was statistically significant, χ^2 (16) = 34.49, $p < 0.005$, and correctly classified 68.2% of cases. The findings revealed that a lower perceived effectiveness of current rules was associated with a higher perceived need for enhanced distracted driving legislation B = −0.14, SE = 0.07, Wald = 3.62, p < 0.05, Exp(B) = 0.86. Additionally, a higher perceived complexity of current rules was positively associated with the perceived necessity for enhanced legislation B = 0.27, SE = 0.08, Wald = 9.17, p < 0.01, Exp(B) = 1.31. A significant gender difference was also found, with females being more likely than males to perceive a higher need for more comprehensive distracted driving rules B = 0.56, SE = 0.21, Wald = 7.23, $p < 0.01$, Exp(B) = 1.76. Furthermore, international licence holders were less likely than open licence holders to report a need for improved legislation B = −0.67, SE = 0.32, Wald = 4.50, $p < 0.05$, Exp(B) = 0.50.

6. Discussion

Guided by the Value-Belief-Norm theory with policy-specific perceptions and by expanding the Susceptibility to Distracted Driving Questionnaire, this study examined drivers' beliefs and behaviours regarding distractions. It also assessed drivers' perceptions of current distracted driving rules and explored how these perceptions differ among individual groups. Further, the study investigated how drivers' engagement in and attitudes toward distractions relate to their perceptions of existing road rules and evaluated the extent to which drivers perceive a need for more comprehensive legislation.

The results of this study revealed a moderate level of engagement with both technological and non-technological distractions. Among technological distractions, adjusting or listening to vehicle audio and using display monitors or navigation systems had the highest average engagement rating, while interacting with passengers and observing external objects had the highest average engagement rating for non-technological distractions. An analysis of the sources with the highest mean engagement ratings in terms of levels of perceived risk and perceived control revealed that while drivers acknowledged the risks associated with these behaviours, they also reported a high sense of control. In other words, although drivers recognise these distractions as risky, they believe they can effectively multitask, which likely explains their engagement in such behaviours. Based on past literature, these risky behaviours are likely explained by the perception of illusory control, which influences drivers' decisions on whether to engage in distractions while driving (Schlehofer et al., 2010). This concept suggests that individuals are motivated to believe they have control over their environment, leading to an overestimation of their ability to avoid negative outcomes (Thompson et al., 2004). Studies on distracted driving have shown that higher levels of illusory control predict more frequent engagement in such behaviours while driving (Schlehofer et al., 2010). This suggests that while drivers tend to overestimate their ability to multitask both in general and while driving, their perceived control over distractions may not align with their actual ability (Finley et al., 2014; Hill et al., 2015). This miscalibration can contribute to riskier driving behaviours and increased engagement in distracted driving activities (Sanbonmatsu et al., 2013).

The results also revealed significant differences in distracted driving beliefs and behaviours based on demographic and background factors. For instance, the findings of this study showed that females reported higher engagement with non-technological distractions than males. However, the results found no significant difference in engagement with technological distractions. This aligns with previous study highlighting no significant gender differences in this behaviour (Oviedo-Trespalacios et al., 2017; Schroeder et al., 2018). The results of this research also found that a significant higher technological distraction engagement was reported by young adults and middle-aged drivers compared to older drivers. This finding aligns with recent research based on Australian Naturalistic Driving Study data, which reported that young drivers engage in distracted driving at higher levels and are less likely to self-regulate their engagement (Koppel et al., In Press). In another study, Cox et al. (2023) noted that, compared to middle-aged and older drivers, younger drivers had significantly higher odds of reporting engagement in secondary device-based behaviours while driving. The results also showed that drivers who had received an infringement in the past three years, regardless of whether it was related to distraction, reported higher levels of engagement with both technological and non-technological distractions compared to those with no previous fines. This shows that the effectiveness of current enforcement measures in preventing the behaviours and addressing the risks associated with distracted driving remains questionable. A previous study has indicated that legal factors do not significantly deter drivers from engaging in distracted driving behaviours, such as mobile phone use. Instead, participants reported being more focused on avoiding getting caught by police (Truelove, Watson-Brown, & Oviedo-Trespalacios, 2023). Additionally, there is limited evidence on the long-term effectiveness of current rules and enforcement measures on reducing distracted driving.

The results of this study indicated that participants generally perceived distracted driving rules as moderately effective. However, most participants emphasised the need for more comprehensive legislation, with those who viewed the rules as less effective being significantly more likely to support more comprehensive regulations. In line with these findings, recent studies in Australia indicated that current legislation inadequately addresses various forms of driver distraction, including both internal and external distractions, as well as the provision of clear safety guidelines (Hinton et al., 2024; Rejali, Watson-Brown, et al., 2024b). Research has also argued that current rules primarily focus on mobile phone use while often overlooking other distractions, such as wearable devices. This limited scope contributes to confusion about which behaviours are legal or illegal, leaving gaps in public awareness (Rejali, Watson-Brown, et al., 2024a). The results of the open-ended questions regarding the effectiveness of the rules also revealed that most participants highlighted areas for improvement, particularly in addressing emerging technologies. Similar concerns were mentioned in responses

about the coverage of the rules, where participants noted limitations and pointed out that while mobile phone use is regulated, less obvious distractions such as wearable devices and in-car infotainment systems remain overlooked. Additionally, participants expressed concerns about the rules' adaptability to evolving technology. This supports previous qualitative findings that show road rules could encompass a broader range of technologies beyond hand-held mobile phones and therefore there exists a need for wider exploration of public perceptions of broader distracted driving legislation (Rejali et al., 2025). Further, Kaviani et al. (2021) emphasised the need for clearer and more effectively communicated legislation on distracted driving in Australia.

The results showed that drivers' beliefs and behaviours regarding distracted driving influence their perceptions of road rules. Notably, higher engagement with non-technological distractions and favourable attitudes toward them were negatively associated with the perceived effectiveness of the rules. While the results are not causal, one possible interpretation of these findings is that drivers who frequently engage in non-technological distracted driving do not perceive the rules as ineffective, potentially due to the limited coverage of these distractions in the road rules or the low level of enforcement that allows the behaviour. In responses to open-ended questions, participants also emphasised strengthening enforcement as a key area for improving the effectiveness of current regulations. Young and Lenné (2010) also noted that an important reason drivers continue to engage in illegal distracting activities is the perception that they are unlikely to be caught by police. The current results also showed that a higher level of risk compensation was negatively associated with the perceived fairness of the rules. Based on these findings, it can be argued that drivers who hold compensatory beliefs, such as slowing down or maintaining a greater following distance while distracted, may perceive the rules as less fair. This perception likely stems from the belief that risk compensation measures are sufficient to mitigate the dangers of distracted driving, leading them to view current road rules as unfair. Studies have shown that risk-compensatory strategies influence how drivers interact with risks. These measures, in turn, shape attitudes toward risks, which subsequently influence distracted driving behaviour (Young & Lenné, 2010). Previous studies have also found that stronger compensatory beliefs are positively associated with increased engagement in distracted driving behaviour (Oviedo-Trespalacios, 2018; Zhou et al., 2020). The current results also revealed that a higher level of perceived control over distractions was negatively associated with the perceived freedom of the rules. This finding suggests that drivers who believe they can multitask while driving are more likely to perceive the rules as restrictive. This perception may stem from an overestimation of their ability to avoid negative outcomes (Sanbonmatsu et al., 2013) or the belief that not all distractions are inherently risky (Rejali, Watson-Brown, et al., 2024a). As a result, they may view the rules as limiting personal freedom rather than protecting from risks.

7. Policy implications

The findings of this study provided insights on drivers' engagement in distractions and found that while certain frequent reported distractions were mentioned as risky, drivers also reported a sense of control over their ability to manage these distractions. This perception, along with moderately favourable attitudes toward engaging in such behaviours, suggests the presence of an illusion of control, where drivers may underestimate the risks involved. Given these findings, future public awareness campaigns, educational initiatives, or public messaging on distracted driving should incorporate content that addresses how overconfidence in ability to multitask, particularly for some less obvious but risky distraction, can lead to misjudgement and eventually increased crash risk. Such interventions may be an effective way to address this issue (Joseph et al., 2016).

The results also showed that participants who were completely familiar with distracted driving reported a significant lower level of engagement with both technological and non-technological distractions compared to those with no or some prior familiarity. These findings highlight the role of familiarity with distracted driving in engaging with distraction sources. For young drivers, higher familiarity with distracted driving could be achieved by informational sessions and workshops in schools and on university campuses, or by integrating distracted driving content further into existing materials for learners and provisional licence holders. For older drivers, educational content could be delivered through public messaging programs through social media and outdoor advertising could further enhance familiarity with distraction sources.

The findings highlighted public support for enhancing distracted driving legislation. Specifically, the results indicated that lower perceived effectiveness and higher perceived complexity of existing regulations are associated with greater perceived need for improvements. These insights show the need for evolving current distracted driving rules to ensure they are comprehensive and easily understood. To enhance effectiveness, policymakers should consider expanding the scope of rules to address a broader range of distracted driving behaviours, particularly those involving technological devices. This includes clarifying the risks associated with emerging technologies and ensuring that legislation keeps pace with advancements in in-vehicle and handheld technology. Additionally, reducing the complexity of existing rules by eliminating ambiguities regarding what constitutes legal and illegal behaviours, that was mentioned in open-ended responses, and providing more detailed definitions and additional examples within road rules could enhance public understanding.

8. Limitations and future research

This study has some limitations that should be acknowledged. First, the research was conducted in Queensland, Australia, with participants required to reside in this state. While a core set of Australia Road Rule guidelines exist, road safety regulations and enforcement measures vary across Australian states and territories, which may limit the generalisability of the findings. This study examined drivers' perceptions of road rules and the factors shaping them, which may be influenced by state-specific policies and enforcement strategies. Also, while the study assessed perceptions of rules, it may not fully account for drivers' actual knowledge or misinterpretation of specific road safety policies. Future research could extend this investigation to other regions to assess the extent of similarities and differences in drivers' perceptions and attitudes. The methods and theoretical framework used in this study may serve as a guide for further research across other states and international contexts. In addition, the study relied on self-reported data to examine distracted driving behaviours. As with all self-report methods, the accuracy of responses depends on participants' honesty and ability to recall their actions correctly. Despite assurances that reporting frequency for illegal behaviours (such as hand-held phone use) would not have consequences, social desirability bias may have influenced participants' responses; nonetheless, engagement in a wide range of distractions, including clearly prohibited mobile phone use, was readily reported by many participants. Further, due to the cross-sectional design of this study, drivers' perceptions and self-reported behaviours could only be captured at the time of the study, rather than how these might change over time. Future studies should consider using naturalistic driving studies or objective measures to better capture actual driving behaviour. Moreover, differences between drivers residing in urban versus rural areas were not examined. Given that engagement distraction sources may vary between these groups, future research should explore potential differences in distracted driving perceptions and behaviours.

9. Conclusion

This study provides insights on drivers' beliefs and behaviours regarding distracted driving and explains how they shape perceptions of related road rules. The findings showed a moderate level of engagement with both technological and non-technological distractions; however, no significant difference between the level of engagement with technology-related and non-technology related distractions was identified. In addition, a higher level of favourable attitudes and a higher perceived level of control over technology-related distractions than non-technological distractions were reported. The findings showed that while drivers generally perceive current rules as effective in covering mobile phone use, gaps in regulating other hand-held technologies and in-vehicle infotainment systems, and ambiguities in legal and illegal behaviours remain. The results indicated that higher engagement with non-technological distractions was negatively associated with perceived rule effectiveness, while greater risk compensation was linked to lower perceived fairness, and higher perceived control over distractions was associated with reduced perceived freedom. The findings highlight the role of behavioural and normative factors in shaping how drivers perceive the effectiveness, fairness, freedom, and complexity of road rules. These insights emphasised the importance of evolving distracted driving rules and enhancing public awareness to improve road safety.

CRediT authorship contribution statement

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

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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Appendix A

Table A1
Cross-tabulation for engagement with distraction sources across age, gender and licence type.

Technological	Male (N = 245)	Female (N = 249)	T-test	Young adults (N = 170)	Middle-aged (N = 244)	Older (N = 80)	F-test	Learner (N = 25)	P1&P2 (N = 43)	Open (N = 350)	international (N = 76)	F-test
Use a hands-free mobile phone	3.20 (1.51)	2.91 (1.66)	$t_{488.99} = 2.07$ p = 0.03	2.94 (1.46)	3.31 (1.68)	2.51 (1.44)	$F_{493} = 8.51$ p = 0.001	2.20 (1.38)	3.18 (1.25)	3.04 (1.62)	3.31 (1.61)	$F_{493} = 3.20$ p = 0.02
Use a hands-held mobile phone	2.26 (1.58)	1.88 (1.38)	$t_{481.22} = 2.78$ p = 0.001	2.28 (1.46)	2.18 (1.56)	1.29 (1.05)	$F_{493} = 13.8$ $p = 0.001$	1.64 (1.15)	2.81 (1.72)	1.89 (1.40)	2.59 (1.63)	$F_{493} = 9.32$ p = 0.001
Listen to or adjust vehicle audio system, radio, or personal music entertainment	3.82 (1.59)	4.20 (1.68)	$t_{492} = 2.58$ p = 0.001	3.88 (1.64)	4.25 (1.66)	3.59 (1.52)	$F_{493} = 5.80$p = 0.003	3.12 (1.50)	3.79 (1.55)	4.18 (1.60)	3.66 (1.81)	$F_{493} = 5.21$ p = 0.001
Look at or use display monitors, navigation systems, or communication devices	3.80 (1.57)	3.81 (1.56)	$t_{492} = 0.08$ $p = 0.93$	3.85 (1.70)	3.90 (1.44)	3.41 (1.56)	$F_{493} = 3.09$ p = 0.05	2.72 (1.54)	3.77 (1.28)	3.87 (1.50)	3.91 (1.84)	$F_{493} = 4.39$ p = 0.005
Look at a smartwatch	2.23 (1.45)	2.02 (1.30)	$t_{484.21} = 1.67$ $p = 0.09$	2.39 (1.41)	2.15 (1.42)	1.49 (0.91)	$F_{493} = 12.2$ p = 0.001	2.16 (1.51)	2.77 (1.44)	1.98 (1.30)	2.41 (1.54)	$F_{493} = 5.58$ p = 0.001
Touch or manually interact with a smartwatch	2.04 (1.47)	1.70 (1.20)	$t_{469.97} = 2.82$ p = 0.001	2.21 (1.51)	1.82 (1.30)	1.29 (0.81)	$F_{493} = 13.4$ p = 0.001	2.08 (1.55)	2.56 (1.68)	1.69 (1.22)	2.24 (1.45)	$F_{493} = 8.21$ p = 0.001
Adjust the settings of vehicle controls and driving assistance systems	3.43 (1.56)	3.10 (1.40)	$t_{484.39} = 2.45$ p = 0.01	3.25 (1.48)	3.31 (1.51)	3.15 (1.45)	$F_{493} = 0.36$ $p = 0.69$	3.24 (1.53)	3.56 (1.40)	3.25 (1.48)	3.18 (1.58)	$F_{493} = 0.64$ $p = 0.58$
Adjust the settings of vehicle comfort features	3.53 (1.49)	3.72 (1.41)	$t_{492} = 1.40$ $p = 0.16$	3.66 (1.53)	3.68 (1.47)	3.38 (1.31)	$F_{493} = 1.44$ $p = 0.23$	3.20 (1.55)	3.86 (1.42)	3.65 (1.38)	3.53 (1.74)	$F_{493} = 1.23$ $p = 0.29$
Non-Technological												
Attend to, have conversations, or react to passengers and children	3.49 (1.39)	3.92 (1.62)	$t_{483.50} = 3.18$ p = 0.002	3.48 (1.57)	4.05 (1.53)	3.14 (1.20)	$F_{493} = 14.2$ p = 0.001	2.92 (1.49)	3.49 (1.36)	3.82 (1.51)	3.55 (1.61)	$F_{493} = 3.43$ p = 0.01
Reach for an object in the car	2.82 (1.37)	3.01 (1.41)	$t_{492} = 1.49$ $p = 0.13$	2.82 (1.30)	3.06 (1.48)	2.68 (1.26)	$F_{493} = 2.96$ p = 0.05	2.32 (1.37)	3.12 (1.34)	3.01 (1.39)	2.55 (1.32)	$F_{493} = 4.16$ p = 0.006
Eat, drink, smoke, or vape	2.60 (1.67)	2.68 (1.49)	$t_{492} = 0.55$ p = 0.58	2.52 (1.69)	2.82 (1.53)	2.34 (1.44)	$F_{493} = 3.64$ p = 0.02	2.04 (1.69)	3.21 (1.97)	2.73 (1.51)	2.11 (1.42)	$F_{493} = 6.50$ $p = 0.001$
Attend to pets	1.95 (1.28)	1.84 (1.24)	$t_{492} = 0.90$ $p = 0.36$	2.07 (1.42)	1.88 (1.21)	1.58 (0.96)	$F_{493} = 4.26$ p = 0.01	2.12 (1.50)	2.58 (1.53)	1.76 (1.10)	2.07 (1.54)	$F_{493} = 6.53$ p = 0.001
Look at fixed external objects	3.16 (1.53)	3.50 (1.33)	$t_{492} = 2.63$ p = 0.01	3.25 (1.47)	3.34 (1.44)	3.48 (1.44)	$F_{493} = 0.67$ $p = 0.51$	3.00 (1.70)	3.21 (1.33)	3.51 (1.43)	2.68 (1.36)	$F_{493} = 7.48$ p = 0.001
Focus on incidents on the road	3.23 (1.44)	3.34 (1.44)	$t_{492} = 0.83$ $p = 0.40$	3.28 (1.52)	3.24 (1.40)	3.45 (1.36)	$F_{493} = 0.65$ $p = 0.52$	2.88 (1.30)	3.49 (1.59)	3.39 (1.42)	2.86 (1.39)	$F_{493} = 3.83$ p = 0.01
Daydream, get lost in thoughts	2.41 (1.50)	2.98 (1.56)	$t_{492} = 4.10$ p = 0.001	2.72 (1.64)	2.67 (1.56)	2.73 (1.35)	$F_{493} = 0.06$ p = 0.93	2.32 (1.31)	3.09 (1.95)	2.75 (1.49)	2.33 (1.62)	$F_{493} = 2.99$ p = 0.03
Sing, dance, or react to music	3.04 (1.59)	3.47 (1.72)	$t_{490.19} = 2.89$ p = 0.004	3.31 (1.89)	3.36 (1.56)	2.83 (1.40)	$F_{493} = 3.23$ p = 0.04	2.44 (1.41)	3.49 (2.02)	3.33 (1.58)	3.07 (1.85)	$F_{493} = 2.82$ p = 0.03

Note: Mean ranges between 1 and 7; young adults: 17–30 years old; middle-aged: 30–55 years old; older: more than 55 years old.

Table A2
Current road rules in QLD for the use of mobile phones while driving.

- One must not drive (including stationary but not parked) and operate any function on a mobile phone including holding in hands or putting on any part of body.

- ***Open and P2 licences*:** If you're an open or P2 licence holder, you are allowed to touch your mobile phone for hands-free use if, for example, the phone is in a cradle attached to the vehicle. Also, you can use a phone hands-free if it's in a pocket of your clothing or a pouch you're wearing. However, you must not touch or look at the phone. It can only be operated using your voice.
- ***Learner and P1 licences*:** Learner and P1 drivers under 25 must not use hands-free, wireless headsets or a mobile phone's loudspeaker function. If your phone is in a pocket of your clothing or a pouch you're wearing, you must not use it in any way. This includes touching it, looking at it or operating it with your voice.

Penalty: AUD$1209 (Approximately USD$750) and 4 demerit points

Data availability

The authors do not have permission to share data.

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