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Is official information about distracted driving enough? A critical investigation of Government-provided information and road rules in Australia

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ABSTRACT

Empirical data demonstrates that distracted driving is a leading cause of crashes even in countries with sophisticated road safety systems. As such, a paradigm shift is needed to prevent driver distraction. This study aims to contribute to this paradigm shift by critically investigating the official distraction-related information and road rules for drivers in Australia, while gaining an understanding of how distraction is specifically addressed in these materials. Using a multistage content analysis, it was identified that official information focuses on three major categories including overview of distraction, sources of distraction, and prevention of distraction. The findings suggested ways that State Governments could improve the available information and road rules, as some of these materials were insufficient or ambiguous. For instance, several sources of distraction, particularly internal distractions (e.g., medical impairments) and external distractions (e.g., advertisement billboards) have been overlooked or received limited attention in the information. Additionally, the information does not address the specific needs of certain road users, such as young and inexperienced drivers. Further, the guidelines for safe interaction with certain in-vehicle distractions such as smartwatches, advanced driving assistance systems, and pets are insufficient or inconsistent across jurisdictions. The rules concerning some distraction types are ambiguous and contain uncertainties. Furthermore, general rules involving distracted driving such as those related to careless driving were found to lack specificity. The results of this investigation provide guidance for policymakers worldwide in developing road rules for distracted driving and the need to change the approach to a more holistic management of distractions.

1. Introduction

Distracted driving is a safety concern worldwide, as it is one of the leading causes of road crashes and injuries. In Australia, distracted driving has been identified as the primary cause of up to 16 % of severe casualty crashes resulting in hospitalisation (Beanland et al., 2013). In Queensland each year, an average of 29 fatalities and 1,284 severe injuries occur on roads due to crashes involving driver distraction, while distraction-related crashes accounted for 21 % of injuries and 10 % of fatalities on the roads in 2021 (Department of Transport and Main Roads, 2021). Similar patterns have been found in other countries. For

instance, NHTSA (2021) reported that in 2021, distracted driving played a role in 3,522 fatalities, constituting 8 % of all traffic-related fatalities in the US. A significant improvement in the share of distracted driving crashes compared to the total number of crashes has not been evident. Indeed, there has even been exacerbation in recent years.

1.1. Conceptualisation of distracted driving

Distraction is defined as anything that takes the driver's attention away from the task of safe driving (Regan et al., 2011). These secondary activities or distractions can emerge from inside the vehicle, internal to

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the driver, or even from outside of the vehicle, both intentional or unintentional (Regan et al., 2011). In-vehicle distractions involve all sources of distraction inside the vehicle. In recent years, this type of distraction has been increasing due to technological advancements. For example, using mobile phones, wearable devices, poorly integrated advanced driver assistance systems (ADAS), voice-based intelligent personal assistants, and heads-up and heads-down displays are some examples of recent technological advances which may lead to driver distraction (Benloucif et al., 2019; Wu et al., 2016). Internal distraction refers to any internal stimulus such as daydreaming, feeling pain or nervousness that may trigger driver distraction (Chan & Singhal, 2015; Vaezipour et al., 2022). External distractions are defined as sources of distraction from outside of the vehicle and include street signs, advertisement billboards, and animals on the road (Chrysler et al., 2017; Oviedo-Trespalacios et al., 2019b).

Distractions can also be classified based on the type of resources that they demand from drivers. For example, visual distraction (taking one's eyes off the road), cognitive distraction (taking one's mind off the road), auditory distraction (taking one's ears off the road), and physical distraction (taking one's hands off the steering wheel) (WHO, 2011). Past evidence has confirmed that drivers are more likely to encounter situations where there is a substantial demand on their visual engagement in comparison with other distraction types (Terry & Terry, 2016; Waddell & Wiener, 2014). This is noteworthy due to the significant link between visual distraction and a higher crash risk (Qin et al., 2019).

Distractions can have a significant impact on driving performance. These impacts include reduced ability to maintain a safe speed, increased reaction time, reduced lane-keeping ability, and slower response to other road users' behaviours (Regan, & Oviedo-Trespalacios, 2022). Moreover, distraction can impair cognitive and perceptual processes, leading to impaired judgment and reduced situational awareness (Young et al., 2013). For example, a distracted driver may fail to notice a pedestrian crossing the street. Extant literature indicated that distractions can negatively affect driving behaviour and even result in injuries and fatalities due to a two-way interaction between distractions and driving (Regan et al., 2011; Rejali et al., 2024). For example, drivers who engage with distractions such as using handheld mobile phones while driving have been shown to experience reduced speed selection, increased variability in the lateral position, and longer braking times (Oviedo-Trespalacios et al., 2016).

1.2. Prevention of distracted driving

Various countermeasures and interventions are commonly employed by governments to reduce distracted driving. Among them, administrative controls which includes establishing appropriate road rules (legislation), enforcing traffic regulations to ensure driver compliance (enforcement), and driver training focused on enhancing drivers' awareness (education) are the most prevalent (Toriumi et al., 2022). Despite the expectation that legislation and enforcement can be the most effective approaches in reducing distracted driving, research has reported conflicting results, indicating that these practices may not necessarily deter the behaviour. For instance, Rudisill et al. (2018) reported that texting bans did not result in a reduction in mobile phone use or texting while driving in the US. Similarly, in Australia, while the country has a leading role in advanced road safety systems with robust rules and enforcement on distracted driving, there has not been a notable improvement in reducing mobile phone use while driving (Oviedo-Trespalacios et al., 2019a).

In addition to the current legislation and enforcement, public education is an additional countermeasure to reduce distracted driving. Education serves as an important element to increase the effectiveness of road regulations. Through education, drivers are encouraged to prioritise road safety and their willingness to comply with road rules (Toriumi et al., 2022). There are several educational programs in Australia directed at educating road users about the risks linked to illegal driving

behaviours and keeping drivers informed about new enforcement initiatives. While these efforts aimed to reduce road fatalities and increase drivers' awareness of distracted driving, uncertainties surround the completeness of their content in comparison with current research findings in this field.

To continue to ensure the effectiveness of both legislation and education in reducing distracted driving, it is important for governments to establish and provide these materials in a clear way. These efforts can facilitate drivers' awareness of the road rules and understanding of the guidelines for the safe interaction with distractions. Otherwise, this lack of awareness of current regulations can result in higher chance of illegal behaviour, particularly mobile phone use (Kaviani et al., 2020). Past evidence in Australia has also reported that current legislation on distracted driving should be more clear, readily available, and effectively communicated to drivers, as many young drivers cannot seek authoritative information through formal channels such as the police due to inadequate or incomprehensible responses (Kaviani et al., 2021).

Other forms of interventions have also been proposed by researchers to reduce distracted driving. Some examples of these interventions include identifying technological solutions such as phone blocking applications (Oviedo-Trespalacios et al., 2020; Reagan and Cicchino, 2020), phone rewarding applications (Munira et al., 2018), driver feedback (Donmez et al., 2008; Ziakopoulos et al., 2023), wearable glasses and wristbands (Dehzangi et al., 2018), and distraction warning systems (Arslanyilmaz, 2020). Given that the ecosystem of interventions for distracted driving is diverse and complex, public awareness about these interventions may be limited.

1.3. The current research

Governments have a responsibility to ensure the safety of road users by providing drivers with thorough information and road rules to raise awareness of the issue and reduce the number of related on-road crashes. However, existing information and road rules for distraction may not effectively deter distracted driving in some cases, resulting in instances where drivers violate the rules, and there exists a lack of understanding regarding the associated risks for drivers. The current study aimed to investigate the current official distraction-related information and road rules provided for drivers by State Governments in Australia to assess their completeness and limitations while gaining an understanding of how distraction is specifically addressed in these materials.

Due to the complex nature of distraction, recent technological advancements, and research developments, official information targeting distracted driving should reflect the latest findings about the issue and the road rules should keep pace with the changing landscape of driver distraction. This study may inform policymakers by highlighting gaps and limitations in existing information and road rules for the development of more effective strategies to reduce the risks of distracted driving. Further, this study provides initial steps towards enhancing road safety education in this context. The case study, Australia, was selected due to its utilisation of state-based policies and its sophisticated road safety system. However, it is important to note that the insights gained from this research may be applicable and beneficial to other countries as well. This approach enables countries to assess their road safety in a global context, offering insights to enhance countries' policies and strategies for improvement.

The three key research questions that this study addressed were:

- What information and road rules about driver distraction are provided for drivers by State Governments and how is distraction addressed in these materials?
- How comprehensive/limited are the official distraction-related information and road rules for drivers, and to what extent do they address various distractions?

- Which types and sources of distraction have received the most attention by State Governments in official information and road rules, and what is overlooked?

The overall structure of the paper is as follows. Section 1 described the research background and aims of this study by focusing on the conceptualisation and prevention of distracted driving. It is then followed by Section 2, which presents the method for content analysis. Sections 3 and 4 present the results of the study and relevant discussions from the model, respectively. Finally, Section 5 and 6 present the practical implications and concluding insights of this study.

2. Method

To critically investigate the official distraction-related information and road rules for car drivers in Australia, a multi-stage content analysis was conducted. Content analysis is a research method for the systematic examination and interpretation of recorded content to make inferences about different aspects of data (Krippendorff, 2018). Fig. 1 shows the different phases of content analysis. The following subsections elaborate on each stage of this process.

2.1. Search strategy, data extraction, and data preparation

After defining the research questions and determining the focus of this study, a search strategy for the content analysis was designed. In the first stage, the relevant sources of data were identified. In Australia, each State Government has its own transport department that provides information, policies, and road rules about distracted driving. Transport departments present this material through a variety of channels including official websites, online brochures and guides, videos and presentations, and educational platforms. Official websites related to the State Governments are among the trusted sources of information for drivers, to inform them about the latest information, policies, road rules, education campaigns, and guidelines for distracted driving.

For identifying the distraction-related content on the official websites of State Governments, a primary search using the keywords of “Distraction” AND “Driving” was conducted. Subsequently, the contents were screened for relevant information, guidelines, and rules about all aspects of distracted driving. Additionally, indirect sources of data such as websites of educational partners, awareness campaigns, and other platforms, which were recommended and linked by official websites, were screened. Fig. 2 shows the official sources of distraction-related material in each Australian State examined: Queensland, New South Wales, Victoria, Western Australia, South Australia, and Tasmania. Two remaining Australian Territories, the Northern Territory (due to the insufficiency of distraction-related information in online sources) and Australian Capital Territory (due to the similarities in provided information and policies with NSW), were not included in this study. This

stage was conducted in December 2022 by the first author, and the inclusion of the extracted contents in the study was assessed and approved through group discussions with the other four authors.

After searching and screening the relevant information and policies about distraction, the material was extracted and transformed into plain text before the coding process. The video and audio format contents were also transcribed into text for coding. In total, 159 records of distraction-related content were extracted for all Australian States, with records dating from 2017 to 2022. Only one record from Tasmania dated back to 2013. The data was clustered according to each State and imported into NVivo v12 for the coding process and further analysis.

2.2. Coding process

After identifying and extracting the relevant content, a two-cycle coding scheme was developed. In the first cycle, two methods of “Domain and Taxonomic Coding” (Spradley, 1980) and “Sub Coding” (Gibbs, 2007) were adopted. In the first round, the first author started the preliminary coding, consistent with past literature on driving distraction, to design the initial coding sheet. The domain and taxonomic method enabled this author to propose an initial hierarchy of the contents. Sub-coding improved the explanation of each code by dividing it into smaller and more specific subcodes. The initial codes were assessed and discussed by the research team several times to ensure the objectivity and generalisability of codes. After conducting the initial round of coding, the second cycle coding was applied to reorganise and reanalyse data and develop coherent and broad categories from the initial codes (Morse, 1994).

For the second cycle of coding, the “Pattern coding” method was conducted (Miles & Huberman, 1994). In this round, the first author generated the first draft of the second cycle coding by proposing the hierarchy of the codes, containing major categories and subcategories. To ensure the validity and reliability of the coding process, all the authors evaluated and revised the proposed hierarchy and codes, separately. After individual revisions, the research team finalised the coding sheet and the research map through group discussions. In total, 856 references in the extracted contents were coded across States. It is important to note that a greater quantity of coded references does not necessarily indicate a higher degree of comprehensiveness in the material’s coverage. The coding process was conducted from January to March 2023. Table A1 presents the hierarchical coding sheet for the distraction-related contents and their descriptions (See Appendix).

3. Results

This study investigated the official online sources of distraction-related information and road rules to evaluate their limitations, completeness, and the focus of the content. To identify the focus of the materials, a word frequency query analysis was conducted. The result of

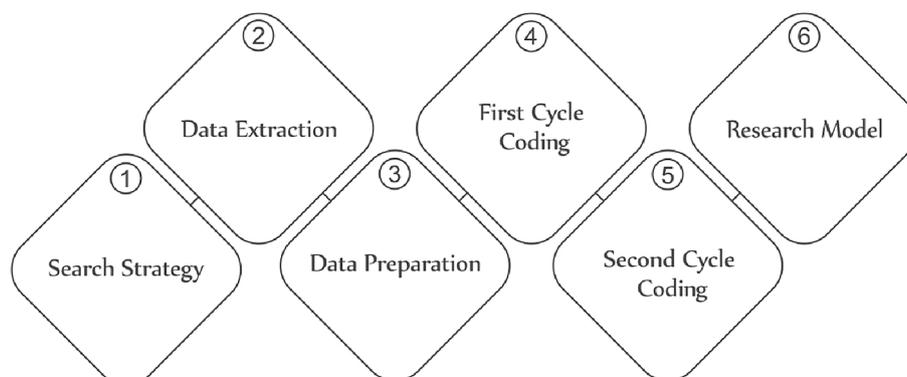


Fig. 1. The content analysis process (Saldaña, 2021).

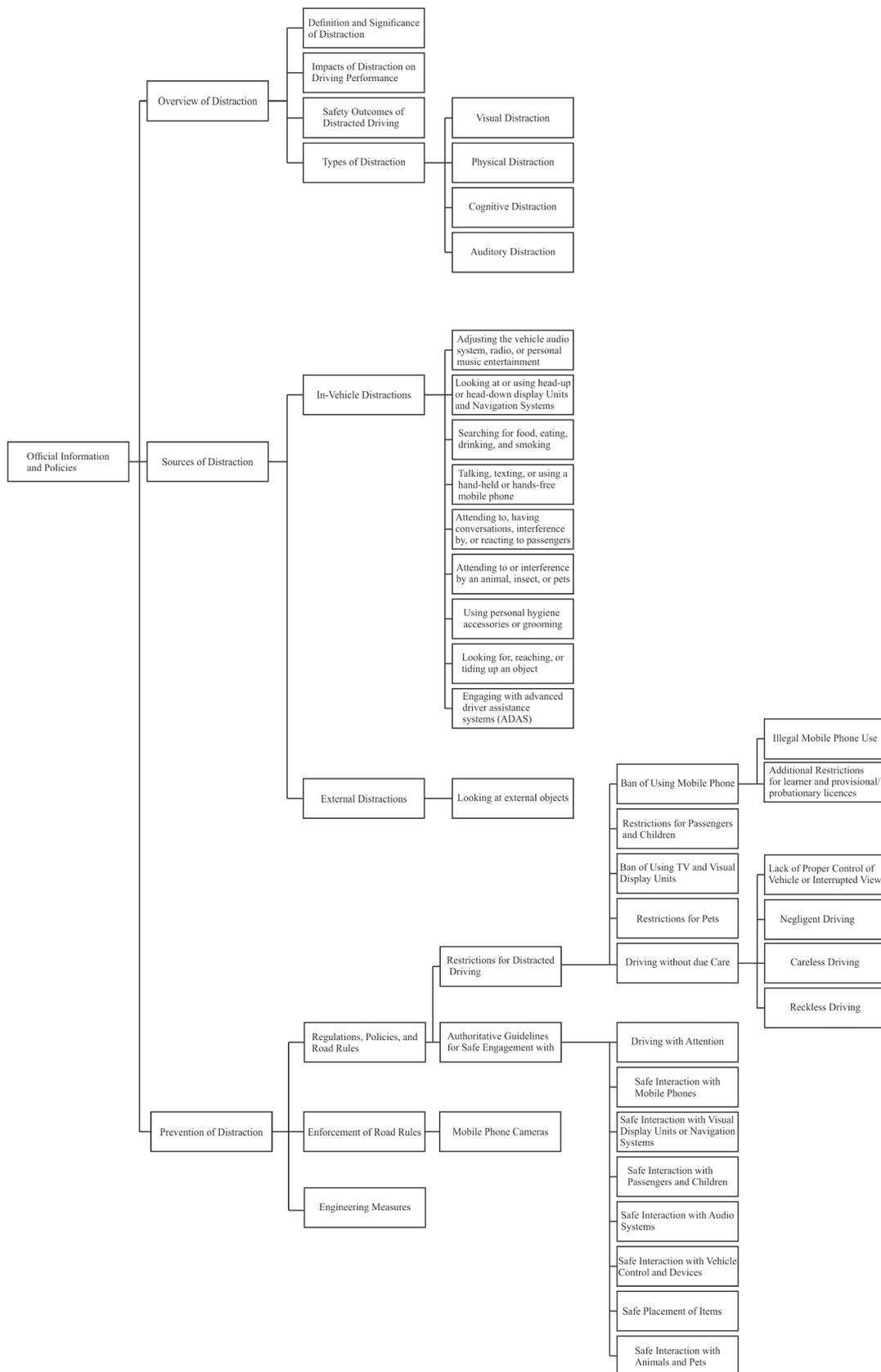


Fig. 4. The research model representing the structure of the content.

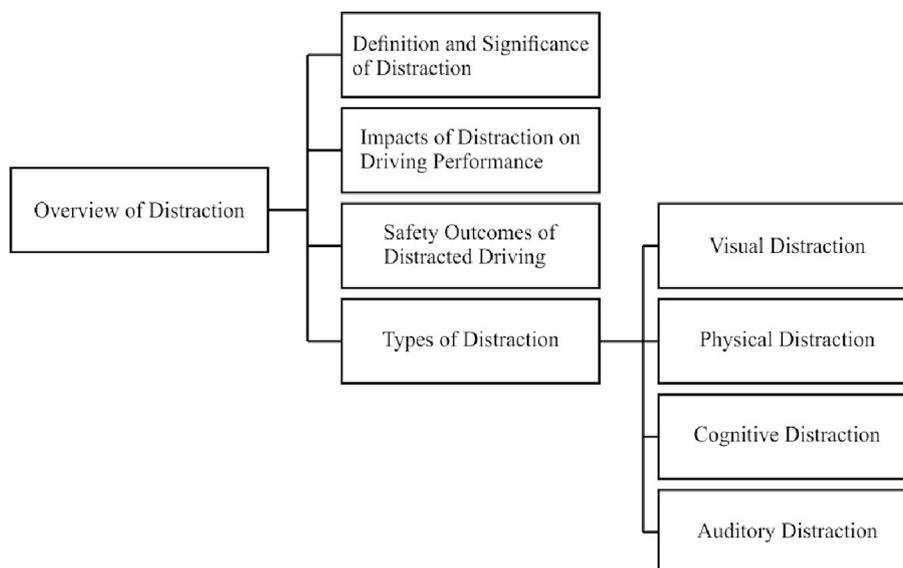


Fig. 5. The structure of the contents for the “Overview of Distraction” category.

(See Table A2), information on definition and significance of distraction and types of distraction were the most frequent in the content analysis, while less information was provided for drivers on the impacts of distraction on driving performance and safety outcomes of distraction.

3.1.1. Definition and significance of distraction

All Australian State Governments have consistently highlighted the importance of distracted driving and have taken steps to provide information to drivers about the definition and significance of driver distractions. They have informed drivers about what constitutes distraction and why it is critical to be aware of it while driving.

“A distraction is anything that takes your eyes off the road, your hands off the wheel, or your mind off driving. Distractions can come from both inside and outside your vehicle.” (NSW, NSW Government, 2021).

“Driver distraction is one of the ‘Fatal Five’ driving behaviours, together with failure to wear a seatbelt, speeding, drink and drug driving, and fatigue.” (QLD, QLD Government, 2020).

3.1.2. Impacts of distraction on driving performance

All State Governments emphasised the hazardous consequences of distracted driving on driving performance and have provided drivers with information on what happens when they are distracted to raise awareness and encourage safe driving practices.

“Distracted driving can reduce your reaction time, make it hard to maintain a consistent speed leading to slowing down or speeding up at inappropriate times, lead to you drifting from your lane or onto the shoulder of the road.” (VIC, Transport Accident Commission, 2022).

“Also, Distracted driving slows down your reaction times and puts you in danger of failing to see hazards such as traffic lights, stop signs or other road users, including pedestrians and cyclists.” (WA, Government of Western Australia, 2019).

3.1.3. Safety outcomes of distracted driving

To depict the risks that distracted drivers are taking, State Governments have provided information of the negative safety consequences associated with distracted driving, including the consequences of distracted driving, resulting in crashes, injuries, and fatalities.

“In 2020, 20 fatalities were the result of inattention-related crashes. Between 2016 and 2020, inattention-related crashes resulted in 524

people killed or seriously injured.” (WA, Government of Western Australia, 2022).

“Driver distraction contributes to almost 20 per cent of serious injuries and 14 per cent of fatalities on Queensland roads each year.” (QLD, QLD Government, 2021).

3.1.4. Types of distraction

General information about the different forms of distraction and how they are differentiated based on their effect on safe driving was provided by State Governments. The content analysis showed that this subcategory consisted of four subcodes, “Visual Distraction”, “Physical Distraction”, “Cognitive Distraction”, and “Auditory Distraction”. Each subcode provides information on a specific type of distraction, its importance, and related risks. Based on the number of coded references, visual distraction has received major attention by State Governments (N = 28), while the information on other types of distraction was fewer compared to this type.

Visual distraction content referred to a reference of a type of distraction that occurs when a person’s eyes are not on the roadway.

“Taking your eyes off the road or diverting your attention even for just a few seconds can be fatal. If you take your eyes off the road – to read a text message for example – while driving at 60 km/h for just two seconds, you’re travelling 33 m blind.” (SA, Government of South Australia, 2022).

The official content related to physical distraction referred to a reference of a type of distraction that occurs when a person’s one or both hands are removed from the steering wheel (N = 8).

“Manual distractions are tasks that require the driver to take a hand (or both hands) off the steering wheel and manipulate a device.” (WA, Government of Western Australia, 2019).

The results of the content analysis revealed that cognitive distraction referred to a reference of a type of distraction that occurs when a person’s mind is not focused on driving (N = 10).

“Distracted driving greatly increases the risk of road trauma by taking a driver’s mind off the job of controlling a vehicle.” (WA, Government of Western Australia, 2019).

“Cognitive distraction is thinking about things other than driving.” (NSW, Transport for NSW, 2022).

The results also showed that auditory distraction referred to a

reference of a type of distraction that occurs when a person is distracted by noise unrelated to the driving task (N = 6).

“Auditory distraction occurs when the driver focuses their attention on auditory signals rather than on the road environment (e.g., children in the back seat).” (WA, Government of Western Australia, 2019).

3.2. Sources of distraction

Drivers are provided with information about sources of distraction while driving. This information can be defined as contents regarding the triggers and stimuli that can divert a driver’s attention away from the primary task of driving to a competing activity. Fig. 6 presents the structure of the contents for this category. The content analysis showed two broad subcategories of “In-vehicle Distraction” (N = 198) and “External Distraction” (N = 12) within this category, consisting of several specific codes to provide general information on different sources of distractions for drivers. The number of coded references showed that the focus of information targeting sources of distraction was on in-vehicle distraction, while limited information has been provided for drivers on external distractions.

3.2.1. In-vehicle distraction

State Governments have presented information about in-vehicle sources of distraction for drivers; however, not all in-vehicle sources

have received a similar amount of attention by the officials. The number of references in the coding process showed that mobile phones was the primary focus of information compared to other in-vehicle sources (N = 111).

“Mobile phone use while driving is one of the most prevalent behaviours associated with driver distraction.” (QLD, QLD Government, 2021).

“Using a mobile phone while driving can increase the risk of crashing by more than 80 per cent.” (TAS, Tasmanian Government, 2022).

Vehicle audio systems, radio, or personal music entertainment were also mentioned by State Governments as major sources of in-vehicle distraction (N = 15). Adjusting the volume or changing songs on audio devices can take drivers’ hands off the steering wheel and their eyes off the road.

“An increasing number of in-vehicle information, communication and entertainment systems including DVD players are being used in cars, which can contribute to a driver being distracted.” (SA, Department for Infrastructure and Transport, 2018).

“It might only be a second or two, but if you’re changing a song on your playlist, you’re not looking at the road ahead.” (WA, Road Safety Commission, 2022).

State Governments have provided information on the role of Visual Display Units (VDUs) on increasing driver distraction and the subsequent risk of crash involvement (N = 9). VDUs include smartwatches,

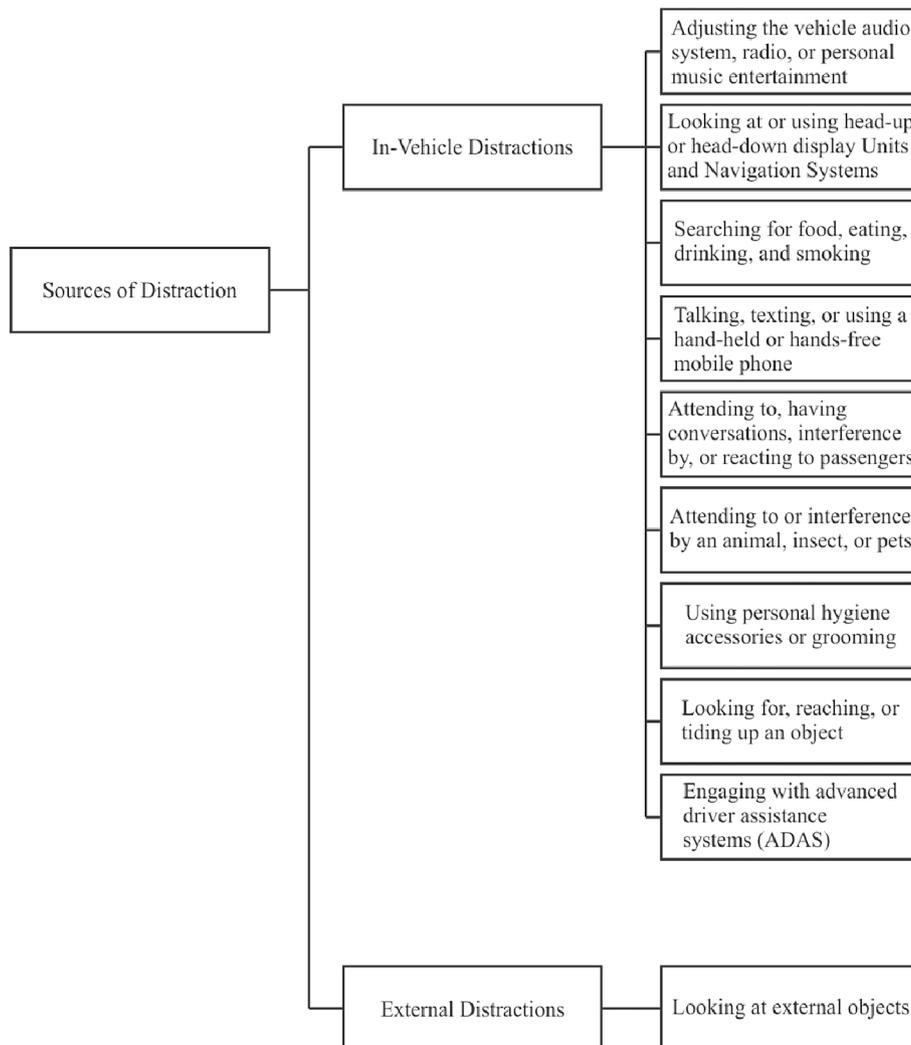


Fig. 6. The structure of the contents for the “Sources of Distraction” category.

head-up or head-down displays, and integrated or navigation systems. Among different types of VDUs, the information on using smartwatches as a source of distraction were limited and not consistent across States. Only the Victorian Government provided information on this matter.

“Distracted driving is any activity that diverts attention from driving, including fiddling with the navigation system.” (WA, Road Safety Commission, 2019).

“Using a Smartwatch while driving or riding can be distracting, increasing your chance of being involved in a crash or near-crash. Looking at or touching a device at the same time as being in control of a vehicle is particularly dangerous.” (VIC, Victoria Roads, 2022).

Australian States provided general information for drivers on consuming food, beverages, tobacco, and smoking devices as sources of distraction (N = 13).

“Eating a snack can all cause a driver to be distracted from their most important task – driving safely.” (WA, Road Safety Commission, 2022).

“Too often, drivers engage in activities that distract them from the driving task including eating, drinking, and smoking” (SA, Department for Infrastructure and Transport, 2018).

State Governments have provided drivers with information about passengers as an in-vehicle source of distraction (N = 33), stating that passengers may engage in conversations with the driver or create loud noises which can divert the driver’s attention away from the road. Children may also divert the driver’s attention, especially when they are hungry or when misbehaving.

“A common distraction when driving is attending to children in the backseat.” (QLD, Department of Transport and Main Roads, 2022).

“Generally, good passengers act as a second set of eyes. They can spot hazards on the road and modify their conversation if the driver needs to respond to a traffic situation. However, distracting passengers can be equally as dangerous.” (NSW, Transport for NSW, 2022).

Although pets can also be a source of distraction for drivers, the content analysis results showed information on animals, insects, or pets as a source of distraction was not comprehensive and limited across States (N = 3).

“Animals in your vehicle can be distracting when you’re driving.” (NSW, NSW Government, 2021).

“Pets can become a distraction whilst you are driving as well as a dangerous projectile if you are involved in a traffic incident. Take care of all precious cargo in the vehicle.” (QLD, QLD Police, 2019).

The findings revealed that the information on the risks of personal grooming, such as applying makeup, brushing hair, or shaving while driving is limited across States (N = 5). The official information showed that using personal hygiene accessories or grooming can take the driver’s mind off the task of driving.

“It might only be a second or two, but if you’re doing your make-up, you’re not looking at the road ahead.” (WA, Government of Western Australia, 2022).

According to the results, loose objects and items in the car can also be a source of distraction since they can divert drivers’ primary focus from the task of driving (N = 4).

“Loose items can cause unsafe distractions.” (NSW, NSW Government, 2021).

“Reaching for something in the car can take the driver’s mind off the risky and dangerous task of driving.” (WA, Road Safety Commission, 2019).

Advanced driver assistance systems (ADAS) have become increasingly prevalent in modern vehicles. However, the content analysis showed that there is limited information on the extent to which

engaging with ADAS may lead to driver distraction (N = 5).

“Automated systems can compensate for some forms of driver distraction, such as lane departure warnings. On the other hand, some in-vehicle technology may in itself lead to distraction.” (WA, Government of Western Australia, 2019).

“While the introduction of ADAS into the vehicle is expected to have many positive safety benefits, it can also lead drivers to change their behaviour in ways not intended by the system designers. Identified or unintended negative effects of ADAS may include compensatory behaviour, over-reliance and diminished attention or distraction.” (TAS, Department of Infrastructure, Energy and Resources, 2013).

3.2.2. External distraction

The results of the content analysis revealed that State Governments have provided information on external distractions for drivers (N = 12). However, the presented information is limited and information on many external sources has not been provided. Among different sources of external distractions, looking at external objects (such as advertisement billboards, street signs, or incidents on the road) is the only external distraction that has received attention by Governments based on the number of the codes (See Appendix).

“There are also distractions outside the vehicle such as roadside advertising that take the drivers’ attention away from the task of driving.” (SA, Government of South Australia, 2022).

“Research shows convincingly that roadside advertising is distracting and that it may lead to poorer vehicle control.” (TAS, Department of Infrastructure, Energy and Resources, 2013).

3.3. Prevention of distraction

The content analysis showed “Prevention of Distraction” as a major category in distraction-related content (N = 515). This category refers to the current countermeasures to prevent distracted driving including three subcategories of “Regulations, Policies, and Road Rules”, “Enforcement of Road Rules”, and “Engineering Measures”. The first subcategory, “Regulations, Policies, and Road Rules”, refers to the official laws and regulations that target distracted driving, as well as official guidelines related to distracted driving on how to stay safe on the road (N = 455). This subcategory was the most frequent within prevention of distraction based on the coded references. The second subcategory, “Enforcement of Road Rules”, provides information on police enforcement (N = 58). The final category, “Engineering Measures” explains engineering solutions to prevent distracted driving; however, the content related to this category was very limited (N = 2). Fig. 7 presents the research model for the “Prevention of Distraction” category representing the structure of the contents.

3.3.1. Regulations, Policies, and road rules

All state Governments have established regulations and rules which aim to prevent driver distraction. The content analysis results showed two smaller subcategories of “Restrictions for Distracted Driving” and “Authoritative Guidelines for Safe Engagement with Distractions” within this subcategory. The first subcategory presents a summary of the restrictions and rules to prevent distracted driving (N = 231), while the latter subcategory presents tips and recommendations for drivers to safely engage with distractions (N = 224).

3.3.1.1. Restrictions for distracted driving. According to the results, five areas including, “Ban of Using Mobile Phone” (N = 167), “Restrictions for Passengers and Children” (N = 9), “Ban of Using TV and Visual Display Units” (N = 15), “Restrictions for Pets” (N = 8), and “Driving without due Care” (N = 32) explained the current distraction-related rules proposed by State Governments to prevent distraction.

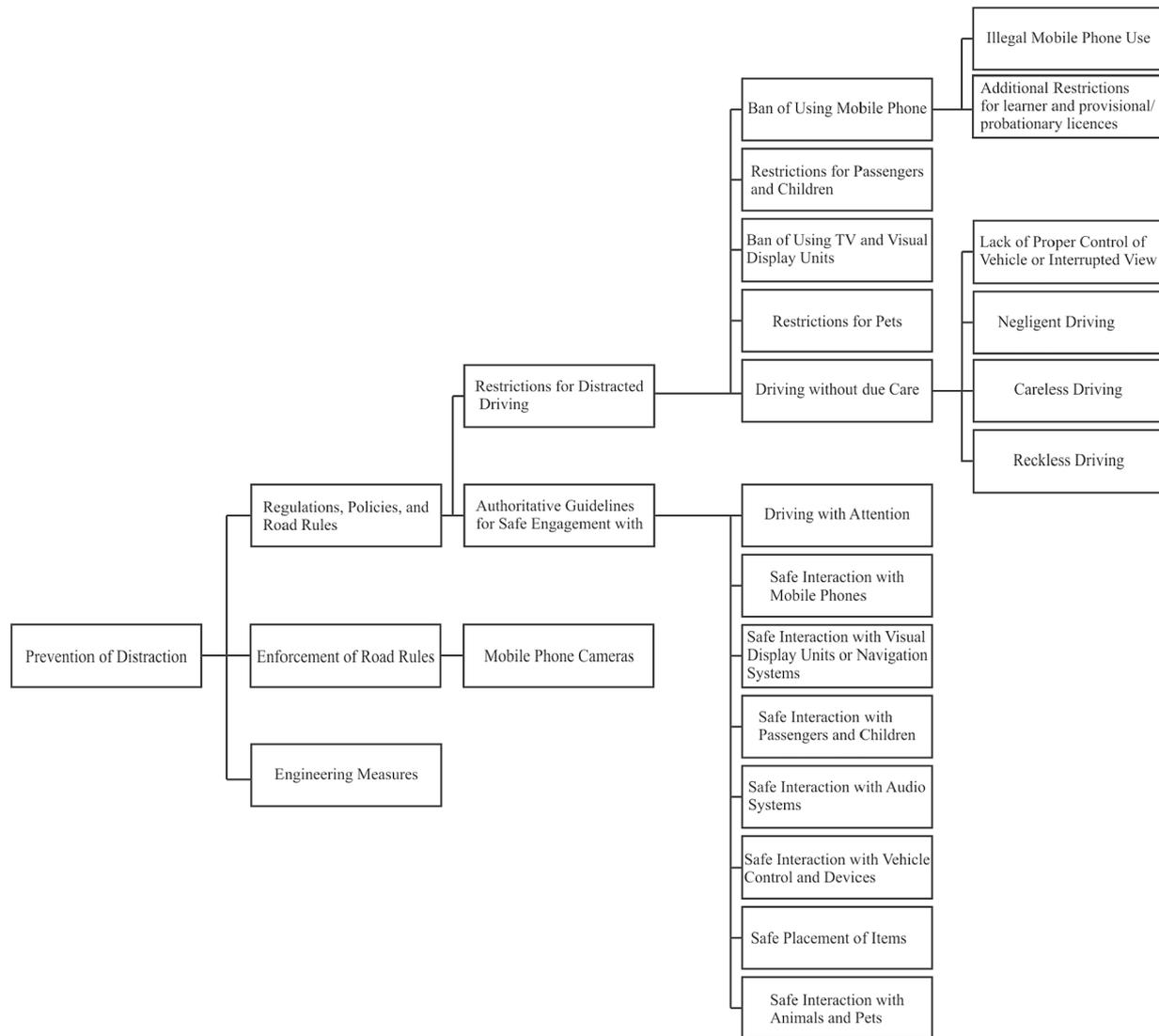


Fig. 7. The structure of the contents for the “Prevention of Distraction” category.

Australian States have established strict laws toward using mobile phones while driving to ensure the safety of all road users. The content analysis showed that mobile phone rules can be divided into two subcodes of, “Illegal Mobile Phone Use” (N = 107) and “Additional Restrictions for Learner and Provisional/Probationary licences” (N = 59). The first subcode explains the rules targeting mobile phone use to prevent distracted driving for all drivers, while the second subcode explains rules targeting mobile phone use for learners or provisional/probationary drivers. Mobile phone rules explain that the driver of a vehicle must not use a hand-held mobile phone at any time while the vehicle is moving or is stationary but not parked; however, some functions might be legal when the phone is placed in a holder or is used hands-free. In Australia, the enforcement of illegal mobile phone use while driving relies on a system of fines and demerit points. The fines and demerit points differ across states, with amounts ranging from \$387 in NSW to \$1161 in QLD for using a hand-held mobile phone. Additionally, in certain states, fines may increase if the offense takes place in school zones or during periods of double demerit points, such as holidays.

“It is illegal to hold a mobile phone in your hand or have it rest on any part of your body, such as your lap, when driving. This applies even if you’re stopped in traffic.” (QLD, QLD Government, 2022).

“It is illegal for the driver of a vehicle to create, send or look at a text message, video message, email, or similar communication, even when the

phone is secured in a mounting or can be operated without touching it.” (WA, Road safety commission, 2022).

Australian States all operate a Graduated Driver Licensing system approach to driver licensing, which is 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). While the system varies slightly between the States, it generally includes a learner stage, one or two provisional/probationary (P1 and P2) stages, and full (open) licence stages. For learners and provisional/probationary drivers, using any function of a mobile phone while driving is banned; however, these additional restrictions for provisional/probationary drivers are not consistent across all Australian States. For instance, while in QLD, learners and P1 drivers cannot use any function of the phone while driving, NSW restricts all learners and provisional drivers (including P2 licence holders) from using their mobile phones.

“Restricted licence holders are not permitted to use their phone at all while driving or riding. This applies regardless of whether the phone in use is being handled, resting on any part of the body, secured in a cradle or is being used hands-free (i.e., via Bluetooth). None of these uses is permitted.” (NSW, Transport for NSW, 2022).

“Learner and P1 drivers under 25 years of age can’t use a mobile phone while driving, including hands-free, headsets or loudspeakers. Their

passengers are also not allowed to use a phone's loudspeaker." (QLD, Department of Transport and Main Roads, 2022).

The content analysis showed that all State Governments have implemented general rules for passengers, including young children and infants, to minimise related distractions of the driver. This includes restrictions from interfering with the driver's control of the vehicle or sitting in the lap of the driver.

"A passenger in or on a vehicle must not interfere with the driver's control of the vehicle or obstruct the driver's view of the road or traffic." (VIC, Victorian Government, 2022).

"A driver must not drive a vehicle if a person or an animal is in the driver's lap." (NSW, NSW Government, 2022).

In Australia, a driver must not drive a vehicle that has a television receiver or visual display unit in or on the vehicle. This rule does not apply if the television is an integrated part of the vehicle design or is secured in a mounting affixed to the vehicle while being used. According to the Victorian Government, smartwatches are considered visual display units and drivers must not use them while driving. However, other Australian States have not yet established specific rules on using smartwatches while driving.

"You must not drive with a digital screen on if you can see it, or it could distract another driver, unless you're using it as a driver's aid." (NSW, NSW Government, 2022).

"When a Smartwatch is worn by a driver it should not be used while driving for making or receiving phone calls, navigation, music, text or video messaging, email, or social media." (VIC, Victoria Roads, 2022).

The content analysis showed that State Governments have established rules targeting pets in vehicles to prevent distracted driving. It is an offence to drive with a pet on the driver's lap as the driver must maintain proper control of the vehicle while driving.

"You must not drive with an animal in your lap, while an animal is being led from the vehicle, including being led by you or a passenger, or while an animal is tied to the outside of the vehicle." (NSW, NSW Government, 2021).

Driving without due care is restricted in Australia. This code consisted of four subcodes of, "Lack of Proper Control of Vehicle or Interrupted View", "Negligent Driving", "Careless Driving", and "Reckless Driving". According to Australian road rules, drivers must always maintain proper control of the vehicle.

"It is illegal to use a hands-free phone whilst driving if it causes you to lose proper control of your vehicle. The penalty is a significant fine and demerit points." (VIC, Victoria Police, 2022).

"Your car must not have any toy or mascot attached to the windows, windscreen, rear view mirror, dash panel or any other part of the vehicle, that may obstruct the driver's view or cause distraction in any way." (WA, Department of Transport, 2022).

The results showed that in some Australian States such as NSW and Tasmania, drivers must not drive negligently. Negligent driving refers to driving carelessly and without proper attention, and frequently breaking driving laws. The driver might be found guilty of negligent driving when interacting with different sources of distraction while driving.

"A person must not drive a motor vehicle on a public street negligently." (TAS, Tasmanian Government, 2022).

Australian States provided restrictions for drivers to prevent careless driving. These rules refer to laws for driving carelessly and without proper attention. This also applies to driving without reasonable consideration for other road users. A motorist whose driving is affected while using a mobile phone or other sources of distraction may also be charged by the police with the offence of careless driving.

"Any person who drives a motor vehicle on a road or elsewhere without due care and attention or reasonable consideration for other people using the road or place is guilty of an offence." (QLD, QLD Government, 2022).

Australian States also provided drivers with restrictions on reckless and dangerous driving. Dangerous driving refers to driving aggressively and recklessly, frequently with intention. The police can charge a driver with the offence of dangerous driving depending on the type of mobile phone use or other sources of distraction while driving, depending on the driver's behaviour, and considering all circumstances.

"A person must not drive a motor vehicle on a road furiously, recklessly or at a speed or in a manner dangerous to the public." (NSW, NSW Government, 2022).

3.3.1.2. *Authoritative guidelines for safe engagement with distractions.* In addition to the rules and restrictions that State Governments have established for drivers, they also provided authoritative guidelines, allowing drivers to engage with different sources of distraction safely. These authoritative guidelines refer to tips and recommendations for safe driving, while drivers are likely to be fined for violating them. The results of the content analysis based on the number of coded references showed that the primary focus of safety instructions for drivers was on safe interaction with mobile phones while driving to minimise related distractions (N = 138). These include putting the phone in a mounted holder, using the phone hands-free, activating the "do not disturb" function while driving, or setting the GPS or playlist before driving.

"Turn off your mobile phone or switch it to 'Do Not Disturb' before you get in your car that way you won't be tempted to answer your phone." (QLD, Department of Transport and Main Roads, 2022).

"If your phone is mounted to the vehicle, you may touch it to make or receive an audio call. If your phone is not mounted to the vehicle, you may only make or receive an audio call if you don't touch your phone." (WA, Government of Western Australia, 2022).

Authoritative guidelines about using visual display units or navigation systems were also frequent across States (N = 25). These recommendations include the size and positioning of the screen, using smartwatches, or using GPS units, safely. While instructions for using the proper screen or GPS units were consistent and comprehensive among States, State Governments (except Victorian Government) neglected to present well-covered and proper safety guidelines for interaction with smartwatches.

"Smartwatches can also be used if the driver does not touch anything on the Smartwatch (for example, making and receiving calls needs to be hands-free via Bluetooth or similar means), and that it is secured in a commercially designed mounting affixed to the vehicle." (VIC, Victoria Roads, 2022).

"Select the smallest appropriate screen for devices mounted on the windscreen. Large, 7-inch GPS devices are available on the market, but significantly obstruct driver's vision in all but the largest vans." (NSW, Transport for NSW, 2017).

All State Governments have presented recommendations for drivers to safely interact with passengers and children in the car to prevent distraction while driving (N = 14). These include restraining children safely and informing the distracting passengers to stop the distracting behaviour.

"Remind your passengers that you need to focus on the road. Make sure kids and pets are safely restrained" (QLD, Department of Transport and Main Roads, 2022).

"As a driver, let your passengers know when their behaviour is distracting you. As a passenger, support the driver by speaking up when other passengers become distracting." (NSW, Transport for NSW, 2022).

Drivers are also provided with guidelines to engage with audio systems safely to reduce related distractions (N = 10). The content analysis showed that adjusting audio systems before departing is the most efficient way to prevent driver distraction.

“Turn off the radio or music, particularly in new or challenging traffic situations.” (NSW, NSW Government, 2021).

“Set your music playlist prior to starting your car and ensure the device is in an approved holder.” (VIC, Transport Accident Commission, 2022).

Vehicle control devices can be distracting; however, limited safety tips have been provided by State Governments to promote drivers' awareness when using these devices (N = 7).

“Make all adjustments before setting off, including mirrors and air conditioning. Clean windscreens and mirrors and make sure your view is unobstructed.” (WA, Government of Western Australia, 2019).

According to the content analysis, limited safety instructions, only by NSW Government, have been presented to drivers to interact safely with objects in the vehicle and their safe placement (N = 1); therefore, this area was widely overlooked in the Australian States' guidelines.

“Put loose items in a bag or box or in the boot.” (NSW, NSW Government, 2021).

State Governments have provided limited tips and recommendations for drivers to safely interact with animals and pets while driving without breaking the law (N = 5). Although restraining the pet is not a rule in Australian States, it is highly recommended by officials to restrain the pet while driving.

“The road rules do not specifically require you to restrain your animal within the vehicle, however, it is safe to do so.” (QLD, QLD Police, 2019).

“Animals in your vehicle can be distracting when you're driving. They should travel in an appropriate area of your vehicle.” (NSW, NSW Government, 2021).

In addition to the mentioned specific areas, drivers were consistently provided with general safety instructions on staying focused and attentive while driving by State Governments (N = 24).

“Recognize what makes you distracted and avoid that activity when driving.” (WA, Government of Western Australia, 2022).

“Avoid the temptation to do other tasks while driving.” (SA, Government of South Australia, 2022).

3.3.2. Enforcement of road rules

Based on the findings of the content analysis, the information provided on official websites primarily focused on introducing mobile phone detection cameras as a highly effective countermeasure to prevent distracted driving (N = 58). The use of mobile phone detection cameras has been implemented in QLD, NSW, and Victoria, with other Australian States expected to soon follow. The content analysis also showed that State Governments have provided drivers with information on the significance, objectives, functioning, and procedures of these cameras to deter distracted driving.

“The cameras take multiple images of every vehicle passing the camera. This includes capturing the registration number plate as well as images of the front seats of the vehicle.” (QLD, QLD Government, 2021).

“Photographs of potential mobile phone offences identified by the computer are then validated by a trained adjudication officer and the relevant information such as registration details is used to issue fines and demerit points to the registered vehicle owner.” (SA, Government of South Australia, 2022).

3.3.3. Engineering measures

Although engineering measures can represent a key strategy for preventing distraction among drivers, limited information has been provided for drivers in about them, particularly from Tasmanian and Western Australian Governments (N = 2). The current information is mostly related to street lighting and audible line marking to prevent inattention and distraction.

“Examples of engineering solutions that redirect attention to the primary task of driving are street lighting and audible line marking.” (TAS, Department of Infrastructure, Energy and Resources, 2013).

“It is difficult to build roads to specifically address distracted driving. Nonetheless, measures can be taken to provide some protection or early warning for drivers drifting off the road.” (WA, Road Safety Commission, 2019).

4. Discussion

4.1. Conceptualising distracted driving

The present investigation reviewed official distraction-related information and road rules provided for drivers by State Governments in Australia to assess their completeness and limitations while gaining an understanding of how distraction is specifically addressed in these materials. Based on the results, the information regarding the overview and conceptualisation of distraction was found to concentrate on definition and significance, impacts, outcomes, and types of distraction. However, when comparing these findings with previous research on distracted driving, notable discrepancies become apparent. This study identified a lack of alignment of the definition of distracted and inattentive driving between official information and academic literature. While driver distraction and driver inattention share a conceptual relationship, the precise boundaries that distinguish them were not clearly observed in the output from the content analysis. For instance, while driver inattention referred to inadequate or no attention on crucial activities for safe driving (Regan, & Oviedo-Trespalcacios, 2022), instances were observed in the official information where driver distraction was defined with the aforementioned definition. This can result in confusion and significant ambiguities for drivers who are seeking authoritative information and exacerbates the challenges of attributing the role of inattention or distraction as contributing factors in roadcrashes.

The results demonstrate that State Governments have acknowledged the negative impacts of distracted driving on driving performance, in line with past academic literature. For example, drivers who engage with using hand-held mobile phones while driving have been shown to experience reduced speed selection, increased variability in the lateral position, and longer braking times (Oviedo-Trespalcacios et al., 2016). An issue that Governments did not acknowledge in their material, but which has been widely described in the literature, is that the impacts of distracted driving on driving performance varies by demographic groups, particularly concerning age. In terms of prevalence, younger drivers have been reported to engage with technologies more than older age groups while driving, resulting in higher risky driving behaviours by this younger cohort on the roads (Ismaeel et al., 2020). Further, reviewing crash data from other countries, such as the US, also reveals that when comparing the percentages of drivers in each age group involved in fatal crashes to those involved in fatal distraction-related crashes, there is a noticeable overrepresentation of distraction among drivers under 35 years old (NHTSA, 2021). These findings suggests that State Governments can develop more targeted information regarding the effects of distractions on driving performance to guarantee that at risk groups such as young drivers remain vigilant in a way that is consistent with their own risk.

In line with the definitions outlined by the World Health Organization (WHO, 2011), State Governments have provided information to drivers regarding various types of distraction based on the impacts of

competing activities on the critical aspects of safe driving. These types include visual, physical, auditory, and cognitive distractions. While these four types of distractions are also well-accepted in the literature, there exists some limitations including restricting the range of actual distractions (e.g., olfactory distraction) or missing out on the potential co-occurrence of types of distraction (e.g., someone talking on the phone and reading a billboard) (Regan, & Oviedo-Trespalacios, 2022). Based on the content analysis, it was found that among the different types of distraction, the information provided by State Governments predominantly focused on visual distraction. This may be due to the critical role it plays in safe driving, as taking one’s eyes off the road for two seconds can result in a doubled risk of a crash or near-crash (Klauer et al., 2014). However, the emphasis on visual distraction can potentially develop an inaccurate understanding among drivers, leading them to perceive other forms of distraction as less important compared to visual distractions.

4.2. The coverage of distracted driving sources

In the literature, different frameworks have been suggested to categorise the sources of distraction, aiming to develop a distraction taxonomy. One of the most popular taxonomies was suggested by Beanland et al. (2013), which clustered sources of distraction into three groups including internal, external, and in-vehicle distractions. Drawing upon this taxonomy, as well as the results of the content analysis (based on the number of coded references), Fig. 8 depicts a chart that highlights the sources of distraction that have been given attention in official information by State Governments, as well as those that have been overlook or received limited attention.

According to the results, the official information for drivers tended to

provide more emphasis on certain sources of distraction compared to others. The most focused area was primarily on the potential hazards associated with talking, texting, or using a hand-held or hands-free mobile phone while driving. In addition to mobile phones, distractions originating from passengers were extensively addressed in official data. The importance of this distraction was emphasised in past literature through the findings of a meta-analysis, which revealed that passenger interaction contributes to 3.55 % of all crashes across all age groups (Theofilatos et al., 2018). A key aspect of this behaviour is that when interacting with passengers, drivers are able to modify their engagement, as conversations in the presence of passengers can be resumed after periods of selective disengagement. This adaptability in conversational dynamics was found to be essential for sustaining driving performance (Charlton, 2009). Overall, these mechanisms of passenger-related distractions were not clearly communicated to drivers.

State Governments have also provided information on the risks of using visual display units while driving. Although the content about the distraction caused by using monitor displays or GPS systems was prevalent in the official information, smartwatches have received relatively less attention. While the Victorian Government has emphasised the risks of using smartwatches, it is recommended that other Australian States also provide information on the risks associated with using smartwatches while driving, as the existing literature also supports the notion (Brodeur et al., 2021). The increasing prevalence of smartwatches has made them a potential source of distraction as drivers might visually interact with them. Smartwatches can reduce drivers’ attention and ability to react quickly, much like when drivers send texts with their mobile phones; however, the smaller display can make it more difficult to read compared to mobile phones requiring additional attentional

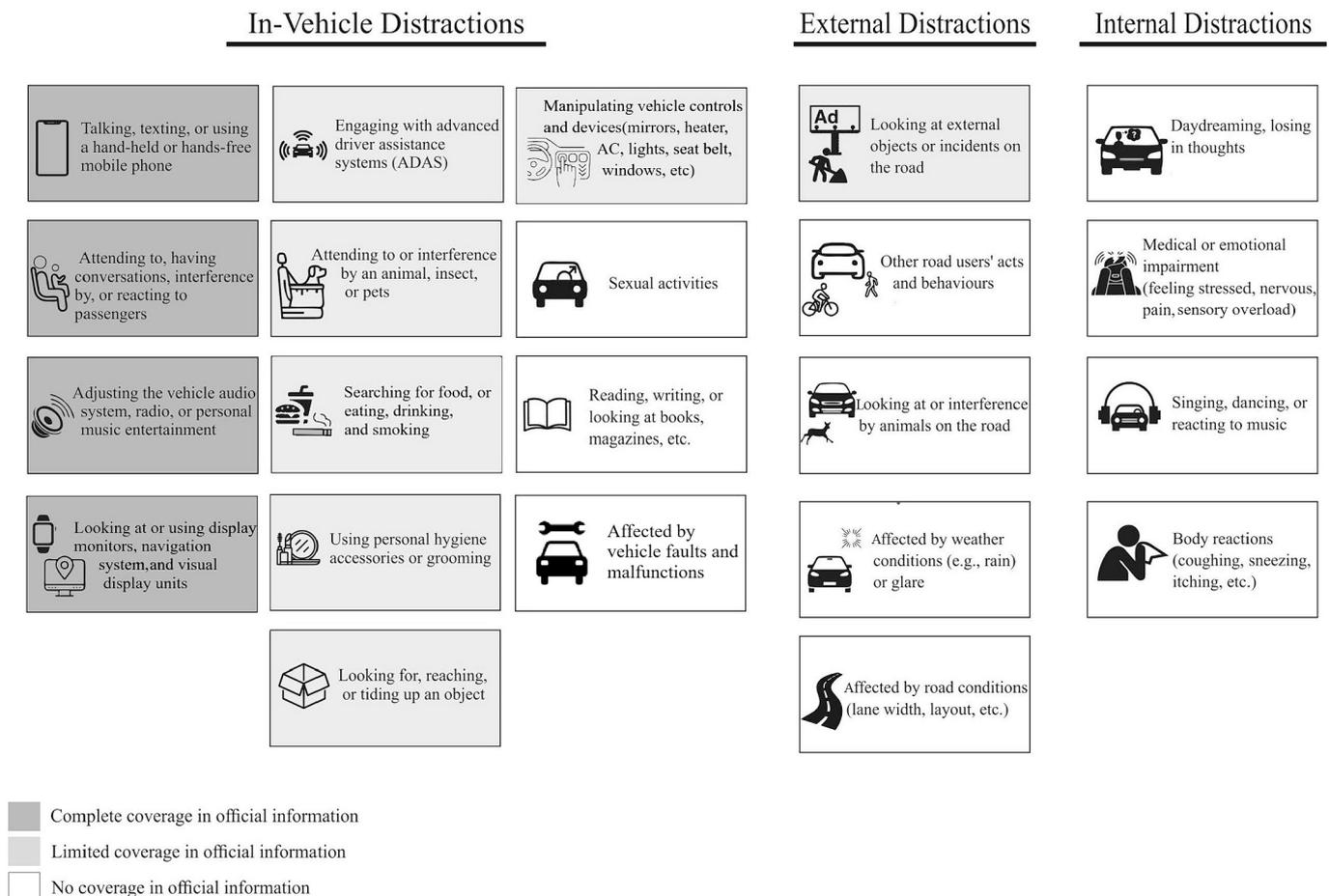


Fig. 8. The coverage of different sources of distraction in the official information.

effort (Caird et al., 2014). Through an analysis of eye-tracking gaze distribution, Brodeur et al. (2021) found that smartwatches may be even more distracting than mobile phones.

Considering the role of certain types of ADAS on the potential to cause driver inattention and distraction, the results of the content analysis, however, found that State Governments have provided limited information on the potential risks associated with ADAS. Recent literature has shown that certain ADAS types may increase secondary task engagement, resulting in affecting drivers' attention and contributing to distracted driving (Hungund et al., 2021). In addition to ADAS, limited information has been provided on the role of pets as an in-vehicle source of distraction for drivers. Pets can pose a potential distraction, particularly for drivers who habitually transport pets when driving. While authorities have presented limited information and guidelines for drivers to secure their pets in the vehicle to prevent distractions while driving, additional information or even more strict rules for restraining pets are necessary as drivers who fail to have proper control over their vehicle due to this matter may be subject to other charges such as driving without due care.

There is evidence that some distractions have been neglected in the official materials. One example is internal distractions. Despite studies demonstrating the significant impact of internal distractions on risky driving, there were no official resources that address this issue to increase drivers' awareness. Examples of internal distractions include, daydreaming, being lost in thought, medical or emotional impairments, and even body reactions (coughing, sneezing, itching, etc.) (Beanland et al., 2013; Regan et al., 2008; Vaezipour et al., 2022). Some recent research has suggested that engaging in sexual activity while driving constitutes a form of distracted driving, as it diverts cognitive and physical resources away from the primary task of operating a vehicle (Oviedo-Trespalacios et al., 2022; Oviedo-Trespalacios & Phillips, 2021). Evidence from the aforementioned studies indicate that these behaviours do occur on the road, warranting inclusion in discussions of distracted driving prevention. However, the existing research is not yet conclusive and requires further investigation.

The official resources from State Governments presented limited information on external distractions for drivers; however, previous literature indicated that external distractions could encompass a broader range than what is presently included in official information. For instance, while State Government resources mainly emphasise the distraction caused by looking at external objects such as billboards (Hinton et al., 2022; Oviedo-Trespalacios et al., 2019b), actions and behaviours of other road users, animals on the road, weather conditions (such as rain and fog) or glare, and the impact of road layout and design could also be provided for drivers.

4.3. Mitigating distracted driving

Within the content analysis of preventions of distractions for drivers, State Governments have prioritised the prohibition of mobile phone use while driving, as well as providing guidelines for safe interaction with these devices. Despite the efforts, there exist certain uncertainties and grey areas for drivers regarding the relevant regulations. For instance, an example when looking at road rules in Queensland is that the use of a personal music device, such as an iPod, while operating a vehicle can pose a risk and distraction similar to that of a mobile phone. However, the current rules in Queensland do not consider holding an iPod while driving to be a violation of the law, as it is not categorised as a mobile phone. Drawing on the insights and experiences of other countries with comparable situations can enhance our understanding of this issue. For instance, in 2019, the legislation in the Netherlands underwent revisions to broaden the prohibition beyond just mobile phones. The updated law encompassed all mobile electronic devices used for communication including tablet computers, media players, and other similar devices (Government of the Netherlands, 2019). This highlights the necessity for enhancing the present road rules in Australia in two primary aspects. Firstly, the road rules should be established in a clear and unambiguous

manner, devoid of any loopholes or equivocal points, to facilitate the comprehension of drivers. A lack of awareness regarding prevailing regulations was identified as a significant predictor of illegal mobile phone use in Australia (Kaviani et al., 2020). Secondly, the communication of the road rules to drivers should be improved, in a manner that is easily accessible and comprehensible, to ensure that drivers can readily access and understand the rules. Previous research has also advocated for the notion that regulations pertaining to mobile phone use while driving should be more clear, readily available, and effectively communicated to drivers. For example, Kaviani et al. (2021) has expounded that while young drivers may learn about the laws through informal channels, such as friends or family members, their efforts to acquire authoritative information through formal avenues, like the police, are frequently frustrated due to inadequate or incomprehensible responses. Further, the findings showed that drivers can be subject to additional charges for distracted driving, including driving without due care, careless driving, negligent driving, and reckless driving. This extension of distracted driving offences may cause confusion for drivers since they can face different charges for engaging with distractions. This can lead to a misunderstanding of the road rules, thereby necessitating clear and unambiguous communication of these regulations to drivers. It should be noted that the presence of general rules without having a clear definition may hinder the education of drivers on the mechanisms of distraction due to the lack of specificity.

The content analysis revealed that the primary focus of road rule enforcement is the use of mobile phone detection cameras, which have been implemented in Queensland, New South Wales, and Victoria, at the time of the data collection for this study. While initial trials have shown that mobile phone detection cameras are effective in reducing mobile phone use among drivers (Transport for NSW, 2023), further research is needed to assess their long-term effectiveness. Studies have stressed the importance of strict enforcement of mobile phone bans to positively affect driver behaviour (McCartt et al., 2006; McCartt et al., 2010). Yet, recent findings indicate that the outcomes might not be as positive as once believed, due to challenges in enforcing the behaviour, the ease with which individuals can conceal their actions, and the availability of technologies designed to evade detection by law enforcement (Truelove et al., 2023). Indeed, nearly 80 % of 35,000 participants in the European Survey Research Association acknowledged that there was a lack of adequate monitoring of road rules regarding mobile phone use while driving (Pires et al., 2020). More evidence is needed to identify effective interventions for mobile phone use while driving.

According to the results of the content analysis, engineering measures have been undertaken by Australian States as a countermeasure for distracted driving. Engineering controls refer to alterations or enhancements made to the physical attributes of machinery or equipment to manage recognised hazards (Regan, & Oviedo-Trespalacios, 2022). Despite the potential of these efforts to prevent distracted driving, constructing roads to specifically target distracted driving poses several challenges. Nonetheless, measures such as early alerts when distracted drivers deviate from their path can still be considered to protect drivers (Candappa et al. (2013)). As outlined by the European Commission (2022), an engineering strategy to prevent road departure crashes resulting from driver distraction involves the installation of longitudinal rumble strips. These strips, equipped with both auditory and tactile feedback, serve to warn drivers when drifting off the road, presenting an economically viable solution.

5. Policy implications

In line with the aim of this study and by providing an investigation of distraction-related information and road rules, the study offers practical recommendations for enhancing road safety education and contributing to efforts to reduce distracted driving-related crashes. The contributions of this study have the potential to make an impact on road safety practices in Australia and worldwide. Since this research highlights that

the current official information and road rules on distracted driving in Australian States can be improved, a set of policy and practical implications are provided for policymakers to address the mentioned gaps and limitations and inform improvements to the current understanding of the topic.

The current study suggests that information on sources of distraction should be provided for drivers in a more comprehensive way to cover the different aspects of distracted driving. Currently, the information is fragmented with a heavy emphasis on mobile phones that leads drivers to perceive other forms of distraction as less important compared to mobile phones. However, it is important to acknowledge that providing more details may not necessarily result in effective education. Instead, prioritising and maintaining consistency on key information could be the most important factor in enhancing drivers' understanding of distraction.

The provided information is not keeping pace with the recent technological advances in many aspects. The interaction with new sources of distraction such as wearable devices and ADAS has received limited attention in road rules and information. Since these technologies are becoming increasingly common, it is essential for governments to adopt a proactive approach. Further, providing safety implications on driver engagement with these technologies can minimise their related risks while driving. In addition, the provided information on distracted driving does not distinguish between different riskier target groups such as young drivers (Oviedo-Trespalcacios et al., 2016). Presenting tailored information on driving distraction can further enhance drivers' awareness toward the issue.

The existing road rules and regulations on distracted driving do not cover all sources of distraction. Specific rules such as mobile phone restrictions are presented to drivers in an ambiguous manner, focusing on the task itself instead of distracting behaviour. It is advisable for policymakers to unambiguously communicate to drivers that any off-road glance lasting two seconds or longer is risky, irrespective of the nature of the task. The existence of general rules that can also involve distracted driving such as those targeting reckless driving or inattentive driving without having a specific definition for what reckless or inattentive driving is can further confuse drivers and make them prone to more serious violations. It is advisable for policymakers to provide drivers with more clarity and specificity regarding these regulations.

6. Limitations and future research

Although the preceding subsections have highlighted several strengths of this study, it is also essential to acknowledge its limitations. First, this study was conducted within the Australian context, and thus the assessments and policy implications are grounded in this context and may not have directly transferable implication for other countries with varying road rules related to distractions. However, the analysis provides a guide that would be useful to apply in other settings to identify any significant gaps. Future studies in other contexts can offer new insights into the methods used by different governments to disseminate information and establish road rules regarding distracted driving, providing a more comprehensive understanding of the issue across a broader range of contexts. Second, distractions can originate from various sources, and developing a framework capable of encompassing all potential sources appears highly complex. Although this research has established a comprehensive framework drawing from previous material on distraction sources, there may exist additional, particularly subtle and infrequent forms of distraction, which have not been considered in this study. Subsequent research is required to assess a wider range of distraction sources that have not been previously investigated or have received minimal attention. Third, it is essential to note that this study has evaluated the road rules and policies provided by six Australian States, and two Australian Territories including Northern Territory and Australian Capital Territory have not been considered in this study. Finally, despite the study's use of a consistent methodology to collect

information and data from official sources for the purpose of content analysis, there is a possibility that sources may have been overlooked during the data acquisition process.

7. Conclusion

The aim of this study was to critically investigate the official distraction-related information and road rules for car drivers. As such, a content analysis was conducted in Australia to assess the completeness and limitations of information and road rules, while gaining an understanding of how distraction is specifically addressed in these materials. The findings of this critical investigation suggested ways that State Governments could improve the information and policies regarding distracted driving, as some of the available information and road rules are ambiguous and can result in inaccurate mental models among drivers which, in the long term, may undermine governments' road safety goals. Furthermore, official information does not consider the need for personalised advice based on group differences such as elderly or novice drivers, which can result in inequities in safety outcomes. Concerningly, many sources of distraction, particularly internal (e.g., daydreaming, medical impairments) and external distractions (e.g., advertisement billboards) have been neglected in the contents which shows a gap in the knowledge provided to drivers concerning distracted driving risks. The authoritative guidelines and tips for safely engaging with specific in-vehicle distractions like smartwatches, ADAS, and pets lacks adequacy or consistency across various states. The rules and regulations related to distracted driving contain uncertainties and grey areas, resulting in leaving out many potential sources of distraction, and are unclear in their presentation. General rules that can also involve distracted driving such as those on reckless driving or inattentive driving lack specificity on definition and may further confuse drivers. Thus, action to improve policy and education contents is needed as well as research to support these endeavours.

CRediT authorship contribution statement

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

Data availability

Data will be made available on request.

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Appendix

Table A1

Coding sheet for content analysis

Code	Description
Overview of Distraction	Summary and a general understanding of the concept of distraction including the significance, impacts, outcomes, and types
Definition and Significance of Distraction	A comprehensive explanation of what distraction is and why it is important
Impacts of Distraction on Driving Performance	Summary of the effects that distractions can have on a person's ability to drive a vehicle safely
Safety Outcomes of Distracted Driving	Explanation of the negative consequences and risks that can result from the distracted driving
Types of Distraction	General information about the different forms that distractions can take, and how they are differentiated based on the effect that distractions can have on safe driving
Visual Distraction	Summary of a type of distraction that occurs when a person's eyes are not on the roadway
Physical Distraction	Summary of a type of distraction that occurs when a person's hands are removed from the steering wheel
Cognitive Distraction	Summary of a type of distraction that occurs when a person's mind is not focused on driving
Auditory Distraction	Summary of a type of distraction that occurs when a person is distracted by noise unrelated to the driving task
Sources of Distraction	General information about the triggers and stimuli that can divert a driver's attention from the primary task of driving to a competing activity
External Distractions	General information about the triggers and stimuli from outside of the vehicle which can cause distraction
Looking at external objects	Summary and general information about interaction with external stimuli such as advertisement billboards, street signs, construction zones, buildings, or incidents on the road
In-Vehicle Distractions	General information about the triggers and stimuli from inside the vehicle which can cause distraction
Adjusting the vehicle audio system, radio, or personal music entertainment	Summary and general information on music equipment as an in-vehicle source of distraction
Looking at or using visual display Units and Navigation Systems	Summary and general information on visual display units as an in-vehicle source of distraction
Searching for food, or eating, drinking, and smoking	Summary and general information on consuming food, beverages, tobacco, and smoking devices
Talking, texting, or using a hand-held or hands-free mobile phone	Summary and general information on using mobile phones as an in-vehicle source of distraction
Attending to, having conversations, interference by, or reacting to passengers	Summary and general information on passengers as an in-vehicle source of distraction
Attending to or interference by an animal, insect, or pets	Summary and general information on animals or pets as in-vehicle sources of distraction
Using personal hygiene accessories or grooming	Summary and general information on personal grooming as an in-vehicle source of distraction
Looking for, reaching, or tiding up an object	Summary and general information on looking for, reaching, or tiding up an object in the car
Engaging with advanced driver assistance systems (ADAS)	Summary and general information on engaging with car's ADAS systems as an in-vehicle source of distraction
Code	Description
Prevention of Distraction	An explanation of the current countermeasures to prevent distracted driving including the ruling, enforcement of laws, and engineering solutions
Regulations, Policies, and Road Rules	An overview of the official laws and policies that target distracted driving, as well as guidelines on how to stay safe on the road
Restrictions for Distracted Driving	A summary of the restrictions and rules to prevent distracted driving
Ban of Using Mobile Phone	Rules targeting mobile phone use to prevent distracted driving
Illegal Mobile Phone Use	Rules targeting mobile phone use to prevent distracted driving for all drivers
Additional Restrictions for learner and provisional/probationary licences	Rules targeting mobile phone use to prevent distracted driving for learner or provisional/probationary drivers
Restrictions for Passengers and Children	Rules targeting passengers to prevent distracted driving
Ban of Using TV and Visual Display Units	Rules targeting visual display units to prevent distracted driving
Restrictions for Pets	Rules targeting pets to prevent distracted driving
Driving without due Care	Rules targeting different driving without due care to prevent distracted driving
Lack of Proper Control of Vehicle or Interrupted View	Rules for driving without maintaining full control of the vehicle
Negligent Driving	Rules for driving carelessly and without proper attention, and frequently with breaking driving laws
Careless Driving	Rules for driving carelessly and without proper attention, and frequently without breaking driving laws
Reckless Driving	Rules targeting driving aggressively and recklessly with the intention
Authoritative Guidelines for Safe Engagement with Distractions	Tips and recommendations for drivers to safely engage with distractions
Driving with Attention	Tips and recommendations for drivers to remain focused while driving
Safe Interaction with Mobile Phones	Tips and recommendations for drivers to use a mobile phone while driving without breaking the laws
Safe Interaction with Visual Display Units or Navigation Systems	Tips and recommendations for drivers to use visual display units while driving without breaking the laws
Safe Interaction with Passengers and Children	Tips and recommendations for drivers to interact with passengers while driving without breaking the laws
Safe Interaction with Audio Systems	Tips and recommendations for drivers to interact with audio equipment while driving without breaking the laws
Safe Interaction with Vehicle Control and Devices	Tips and recommendations for drivers to interact with vehicle controls while driving without breaking the laws
Safe Placement of Items	Tips and recommendations for drivers for safe placement of an object in the car without breaking the laws
Safe Interaction with Animals and Pets	Tips and recommendations for drivers to interact with animals and pets while driving without breaking the laws
Enforcement of Road Rules	Summary and general information on enforcing the current distraction-related road rules
Mobile Phone Cameras	A comprehensive explanation on the importance and functionality of mobile phone cameras
Engineering Measures	An explanation and overview on engineering measures to prevent distracted driving

Table A2
The number of references coded across Australian States

Code	Total References	QLD	NSW	VIC	WA	SA	TAS
Overview of Distraction	131	12	23	11	33	30	22
Definition and Significance of Distraction	43	7	11	2	10	10	3
Impacts of Distraction on Driving Performance	18	1	3	3	3	4	4
Safety Outcomes of Distracted Driving	14	3	0	1	5	1	4
Types of Distraction	56	1	9	5	15	15	11
Visual Distraction	28	1	6	3	8	6	4
Physical Distraction	8	0	1	1	2	3	1
Cognitive Distraction	10	0	1	0	3	4	2
Auditory Distraction	6	0	1	0	2	2	1
Sources of Distraction	210	31	31	26	49	52	21
External Distractions	12	0	1	0	7	2	2
Looking at external objects	12	0	1	0	7	2	2
In-Vehicle Distractions	198	31	30	26	42	50	19
Adjusting the vehicle audio system, radio, or personal music entertainment	15	1	1	1	4	7	1
Looking at or using head-up or head-down display Units and Navigation Systems	9	0	1	3	4	0	1
Searching for food, or eating, drinking, and smoking	13	0	1	2	4	5	1
Talking, texting, or using a hand-held or hands-free mobile phone	111	28	16	14	17	24	12
Attending to, having conversations, interference by, or reacting to passengers	33	1	8	5	5	13	1
Attending to or interference by an animal, insect, or pets	3	1	2	0	0	0	0
Using personal hygiene accessories or grooming	5	0	0	1	2	1	1
Looking for, reaching, or tidying up an object	4	0	1	0	2	0	1
Engaging with advanced driver assistance systems (ADAS)	5	0	0	0	4	0	1
Prevention of Distraction	515	146	149	51	57	90	22
Regulations, Policies, and Road Rules	455	129	123	50	55	79	19
Restrictions for Distracted Driving	231	76	59	23	19	42	12
Ban of Using Mobile Phone	167	65	47	13	10	28	4
Illegal Mobile Phone Use	107	41	26	8	10	18	4
Additional Restrictions for learner and provisional/probationary licences	59	24	20	5	0	10	0
Restrictions for Passengers and Children	9	2	2	1	2	1	1
Ban of Using TV and Visual Display Units	15	2	4	4	2	1	2
Restrictions for Pets	8	2	2	1	1	1	1
Driving without due Care	32	5	4	4	4	11	4
Lack of Proper Control of Vehicle or Interrupted View	14	3	2	3	3	2	1
Negligent Driving	2	0	1	0	0	0	1
Careless Driving	12	2	0	1	1	7	1
Reckless Driving	5	0	1	0	1	2	1
Authoritative Guidelines for Safe Engagement with Distractions	224	53	64	27	36	37	7
Driving with Attention	24	7	1	1	5	9	1
Safe Interaction with Mobile Phones	138	41	43	13	12	26	3
Safe Interaction with Visual Display Units or Navigation Systems	25	0	9	9	6	1	0
Safe Interaction with Passengers and Children	14	3	4	1	3	1	2
Safe Interaction with Audio Systems	10	1	3	3	2	0	1
Safe Interaction with Vehicle Control and Devices	7	0	2	0	5	0	0
Safe Placement of Items	1	0	1	0	0	0	0
Safe Interaction with Animals and Pets	5	1	1	0	3	0	0
Enforcement of Road Rules	58	17	26	1	1	11	2
Mobile Phone Cameras	58	17	26	1	1	11	2
Engineering Measures	2	0	0	0	1	0	1

References

- Arslanyilmaz, A., 2020. Hazard warning systems to improve young distracted drivers' hazard perception skills. *Safety* 6 (1), 12.
- Beanland, V., Fitzharris, M., Young, K.L., Lenné, M.G., 2013. Driver inattention and driver distraction in serious casualty crashes: data from the Australian National Crash in-depth Study. *Accident Analysis & Prevention* 54, 99–107.
- Benloucif, M.A., Sentouh, C., Floris, J., Simon, P., Popieul, J.-C., 2019. Online adaptation of the level of haptic authority in a lane keeping system considering the driver's state. *Transportation Research Part f: Traffic Psychology and Behaviour* 61, 107–119.
- Brodeur, M., Ruer, P., Léger, P.-M., Senecal, S., 2021. Smartwatches are more distracting than mobile phones while driving: results from an experimental study. *Accident Analysis & Prevention* 149, 105846.
- Caird, J.K., Johnston, K.A., Willness, C.R., Asbridge, M., Steel, P., 2014. A meta-analysis of the effects of texting on driving. *Accident Analysis & Prevention* 71, 311–318.
- Candappa, N., Devlin, A., Logan, D., & Corben, B. (2013). Designing safer roads to combat driver errors: rural crashes.
- Chan, M., Singhal, A., 2015. Emotion matters: implications for distracted driving. *Safety Science* 72, 302–309.
- Charlton, S.G., 2009. Driving while conversing: cell phones that distract and passengers who react. *Accident Analysis & Prevention* 41 (1), 160–173.
- Chrysler, S.T., Carlson, P.J., Brimley, B., Park, E.S., 2017. Effects of full matrix color changeable message signs on legibility and roadway hazard visibility. *Transportation Research Record* 2617 (1), 9–18.
- Dehzangi, O., Rajendra, V., Taherisadr, M., 2018. Wearable driver distraction identification on-the-road via continuous decomposition of galvanic skin responses. *Sensors* 18 (2), 503.
- European Commission, 2022. European road safety observatory, road safety thematic report, driver distraction Retrieved 23/02/2024 from https://road-safety.transport.ec.europa.eu/system/files/2022-04/Road_Safety_Thematic_Report_Driver_Distraction_2022.pdf.
- Department of Transport and Main Roads. (2021). *Queensland Road Crash Report* Retrieved 25/06/2023 from https://cars.tmr.qld.gov.au/Static/documents/RoadCrashReport/Weekly/WeeklyReport_Latest.pdf.
- Donmez, B., Boyle, L.N., Lee, J.D., 2008. Mitigating driver distraction with retrospective and concurrent feedback. *Accident Analysis & Prevention* 40 (2), 776–786.
- Gibbs, G.R., 2007. Thematic coding and categorizing. *Analyzing Qualitative Data* 703, 38–56.
- Government of the Netherlands, 2019. Ministry of Infrastructure and Water Management, use of mobile telecommunications equipment. Retrieved 23/02/2024 from. <https://zoek.officielebekendmakingen.nl/stb-2019-237.html>.
- Hinton, J., Watson, B., Oviedo-Trespalacios, O., 2022. A novel conceptual framework investigating the relationship between roadside advertising and road safety: the driver behaviour and roadside advertising conceptual framework. *Transportation Research Part f: Traffic Psychology and Behaviour* 85, 221–235.

- Hungund, A.P., Pai, G., Pradhan, A.K., 2021. Systematic review of research on driver distraction in the context of advanced driver assistance systems. *Transportation Research Record* 2675 (9), 756–765.
- Ismaeel, R., Hibberd, D., Carsten, O., Jamson, S., 2020. Do drivers self-regulate their engagement in secondary tasks at intersections? an examination based on naturalistic driving data. *Accident Analysis & Prevention* 137, 105464.
- Kaviani, F., Young, K., Robards, B., Koppel, S., 2020. Nomophobia and self-reported smartphone use while driving: an investigation into whether nomophobia can increase the likelihood of illegal smartphone use while driving. *Transportation Research Part f: Traffic Psychology and Behaviour* 74, 212–224.
- Kaviani, F., Benier, K., Robards, B., Young, K., Koppel, S., 2021. “Does that mean I can’t use my phone to pay when i’m in the maccas drive thru?”: younger drivers’ uncertainty and attitude toward smartphone law and punishment. *Accident Analysis & Prevention* 160, 106314.
- Klauer, S.G., Guo, F., Simons-Morton, B.G., Ouimet, M.C., Lee, S.E., Dingus, T.A., 2014. Distracted driving and risk of road crashes among novice and experienced drivers. *New England Journal of Medicine* 370 (1), 54–59.
- Krippendorff, K., 2018. *Content analysis: an introduction to its methodology*. Sage publications.
- McCartt, A.T., Hellinga, L.A., Geary, L.L., 2006. Effects of Washington, DC law on drivers’ hand-held cell phone use. *Traffic Injury Prevention* 7 (1), 1–5.
- McCartt, A.T., Hellinga, L.A., Strouse, L.M., Farmer, C.M., 2010. Long-term effects of handheld cell phone laws on driver handheld cell phone use. *Traffic Injury Prevention* 11 (2), 133–141.
- Miles, M.B., Huberman, A.M., 1994. *Qualitative data analysis. An expanded sourcebook*. sage.
- Morse, J. M. (1994). *Critical issues in qualitative research methods*. sage.
- Munira, S., Henk, R.H., Tisdale, S., 2018. An Incentive-Based Teen Driver Smartphone App: Results of 2017 Pilot Project. United States, Washington DC.
- Nhtsa, 2021. National Highway Traffic Safety Administration-Distracted driving-overview. Retrieved 21/02/2024 from. <https://www.nhtsa.gov/risky-driving/distracted-driving>.
- Oviedo-Trespalacios, O., Haque, M.M., King, M., Washington, S., 2016. Understanding the impacts of mobile phone distraction on driving performance: a systematic review. *Transportation Research Part c: Emerging Technologies* 72, 360–380.
- Oviedo-Trespalacios, O., Nandavar, S., Newton, J.D.A., Demant, D., Phillips, J.G., 2019a. Problematic use of mobile phones in Australia... is it getting worse? *Frontiers in Psychiatry* 10, 105.
- Oviedo-Trespalacios, O., Newton, J.D.A., Demant, D., Phillips, J.G., Struckman-Johnson, C., 2022. Understanding sexual activity while driving as a form of distracted driving. *Accident Analysis & Prevention* 169, 106621.
- Oviedo-Trespalacios, O., Phillips, J.G., 2021. Sexual activity while driving: a content analysis of media reports. *Transportation Research Part f: Traffic Psychology and Behaviour* 80, 141–149.
- Oviedo-Trespalacios, O., Truelove, V., King, M., 2020. It is frustrating to not have control even though I know it’s not legal!”: A mixed-methods investigation on applications to prevent mobile phone use while driving. *Accident Analysis & Prevention* 137, 105412.
- Oviedo-Trespalacios, O., Truelove, V., Watson, B., Hinton, J.A., 2019b. The impact of road advertising signs on driver behaviour and implications for road safety: a critical systematic review. *Transportation Research Part a: Policy and Practice* 122, 85–98.
- Pires, C., Torfs, K., Areal, A., Goldenbeld, C., Vanlaar, W., Granić, M.-A., Stürmer, Y.A., Usami, D.S., Kaiser, S., Jankowska-Karpa, D., 2020. Car drivers’ road safety performance: a benchmark across 32 countries. *IATSS Research* 44 (3), 166–179.
- Qin, L., Li, Z.R., Chen, Z., Bill, M.A., Noyce, D.A., 2019. Understanding driver distractions in fatal crashes: an exploratory empirical analysis. *Journal of Safety Research* 69, 23–31.
- Queensland Government, 2022. Your keys to driving in Queensland. Retrieved 16/11/2023 from. <https://www.publications.qld.gov.au/dataset/b7212180-9469-4092-88e1-0d33c6973df3/resource/772baf5c-c14c-476f-a118-8c7a22b296be/download/your-keys-to-driving-in-queensland-september-2021-queensland-licensing.pdf>.
- Reagan, I.J., Cicchino, J.B., 2020. Do not disturb while driving-use of cellphone blockers among adult drivers. *Safety Science* 128, 104753.
- Regan, M.A., Lee, J.D., Young, K., 2008. *Driver distraction: theory, effects, and mitigation*. CRC Press.
- Regan, M.A., Hallett, C., Gordon, C.P., 2011. Driver distraction and driver inattention: definition, relationship and taxonomy. *Accident Analysis & Prevention* 43 (5), 1771–1781.
- Regan, & Oviedo-Trespalacios. *Driver Distraction: mechanisms, evidence, prevention, and mitigation The Vision Zero Handbook: Theory, Technology and Management for a Zero Casualty Policy 2022* Springer 1 62.
- Rejali, S., Aghabayk, K., Seyfi, M., Oviedo-Trespalacios, O., 2024. Assessing distracted driving crash severities at New York City urban roads: A temporal analysis using random parameters logit model. *IATSS Research* 48 (2), 147–157.Chicago.
- Rudisill, T.M., Smith, G., Chu, H., Zhu, M., 2018. Cellphone legislation and self-reported behaviors among subgroups of adolescent US drivers. *Journal of Adolescent Health* 62 (5), 618–625.
- Saldaña, J., 2021. *The coding manual for qualitative researchers, (Fourth edition. ed.)*. SAGE Publications.
- Spradley, J.P., 1980. *Taxonomic analysis: Participant observation*. In. Harcourt Brace, Fort Worth.
- Terry, C.P., Terry, D.L., 2016. Distracted driving among college students: perceived risk versus reality. *Current Psychology* 35, 115–120.
- Theofilatos, A., Ziakopoulos, A., Papadimitriou, E., Yannis, G., 2018. How many crashes are caused by driver interaction with passengers? a meta-analysis approach. *Journal of Safety Research* 65, 11–20.
- Toriumi, A., Abu-Lebdeh, G., Alhajyaseen, W., Christie, N., Gehlert, T., Mehran, B., Mussone, L., Shawky, M., Tang, K., Nakamura, H., 2022. A multi-country survey for collecting and analyzing facts related to road traffic safety: legislation, enforcement, and education for safer drivers. *IATSS Research* 46 (1), 14–25.
- Transport for NSW, 2023. Mobile phone detection cameras. Retrieved 18/03/2023 from NSW Government. <https://roadsafety.transport.nsw.gov.au/stayingsafe/mobilephones/technology.html#faq5>.
- Truelove, V., Stefanidis, K., Mills, L., Oviedo-Trespalacios, O., 2023. Police and public perspectives on the use and impacts of technology that expose enforcement locations for phone use while driving. *Safety science* 164, 106155. Chicago.
- Vaezipour, A., Horswill, M.S., Andrews, N.E., Johnston, V., Delhomme, P., Oviedo-Trespalacios, O., 2022. How distracting is chronic pain? the impact of chronic pain on driving behaviour and hazard perception. *Accident Analysis & Prevention* 178, 106856.
- Waddell, L.P., Wiener, K.K., 2014. What’s driving illegal mobile phone use? psychosocial influences on drivers’ intentions to use hand-held mobile phones. *Transportation Research Part f: Traffic Psychology and Behaviour* 22, 1–11.
- WHO. (2011). *World Health Organization, Mobile phone use: a growing problem of driver distraction*.
- Wu, X., He, J., Ellis, J., Choi, W., Wang, P., Peng, K., 2016. Which is a better in-vehicle information display? a comparison of Google glass and Smartphones. *Journal of Display Technology* 12 (11), 1364–1371.
- Young, K.L., Salmon, P.M., Cornelissen, M., 2013. Distraction-induced driving error: an on-road examination of the errors made by distracted and undistracted drivers. *Accident Analysis & Prevention* 58, 218–225.
- Ziakopoulos, A., Kontaxi, A., Yannis, G., 2023. Analysis of mobile phone use engagement during naturalistic driving through explainable imbalanced machine learning. *Accident Analysis & Prevention* 181, 106936.