

Designed to deter: community perceptions of police vehicles, markings and the certainty of apprehension and punishment

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Abstract

Purpose – This study explores how police vehicle design influences public perceptions of enforcement capability and driver behaviour. It addresses a gap in the literature on how specific visual elements shape perceived certainty of apprehension, certainty of punishment and the duration of deterrent effects.

Design/methodology/approach – Semi-structured interviews were conducted with 40 Queensland-licensed drivers aged 18 years and older. Participants commented on the design elements that were most salient to them when it came to police vehicles. Participants also evaluated various police vehicle designs through open-ended questions and image-based rating tasks. A thematic analysis identified themes in perceptions around police vehicle designs and reported behavioural responses.

Findings – Participants consistently distinguished vehicles by visual cues, particularly the markings and bright colour of the vehicle impacted perceived deterrent effects. Traffic enforcement-focused vehicles, such as Highway Patrol cars and motorcycles, were seen as more deterrent than general duties (GD) vehicles, producing stronger immediate behaviour change and longer-lasting “halo effects”. Vehicle type, base vehicle colour, markings and visible equipment were described differently relative to perceptions of enforcement capability, the perceived role of that vehicle and associated behavioural responses.

Practical implications – The findings suggest that strategic police vehicle design serves as a force multiplier, enabling agencies to maximise deterrent impact with limited resources. Highly visible, purpose-designed traffic enforcement vehicles may yield greater road safety outcomes than deploying generic police vehicles.

Originality/value – This research provides a detailed examination of drivers’ perception of police vehicle designs and the way in which such designs are associated with deterrence perceptions, offering evidence for consideration during vehicle procurement and deployment strategies to enhance road safety outcomes.

Keywords Behavior analysis, Perceptual deterrence, Perception of the police, Traffic law enforcement, Policing work

Paper type Research article

Introduction

Road traffic crashes are a leading cause of death and serious injury worldwide (World Health Organization, 2023), with speeding, impairment and other risky behaviours contributing heavily to the human and economic toll. Governments have responded with enforcement strategies to improve compliance and safety, with road policing central to both detecting and punishing offenders and shaping perceptions of risk. Road policing serves both reactive functions, such as responding to crashes and apprehending offenders, and proactive functions, including high-visibility enforcement operations designed to deter illegal driving behaviour (Hakkert and Gitelman, 2005; Prenzler, 2012). Through these activities, police play a key role



in shaping drivers' perceptions of risk and reinforcing road rules across the road network. Within Australia, road policing also represents the most common context in which members of the public interact with police, with [Roberts and Indermaur \(2009\)](#) finding over one-half of police contact was during roadside encounters. This underscores the centrality of traffic-related interactions within policing and highlights the importance of understanding how drivers interpret and respond to police presence on the road.

Road policing is fundamentally grounded in the deterrence theory, which posits that offending declines when individuals perceive that a high likelihood of detection and sanction would result from illegal behaviour ([Paternoster, 2019](#); [Raskolnikov, 2020, 2021](#)). Deterrence theory distinguishes three core dimensions: certainty, referring to the perceived likelihood of apprehension; severity, referring to the perceived harshness of the punishment and swiftness, referring to how promptly punishment follows the offence. General deterrence, which aims to shape broader public behaviour through the perceived risk of enforcement rather than solely targeting detected offenders, is the mechanism most directly relevant to road policing ([Davey and Freeman, 2011](#); [Nagin, 2013](#)). Of these dimensions, certainty of apprehension has consistently been shown to exert the strongest influence on driver behaviour ([Durlauf and Nagin, 2010](#); [Nagin and Pogarsky, 2001](#)). Road policing activities designed in accordance with deterrence theory principles are therefore primarily aimed to increase the perceived likelihood that traffic offending will be detected and sanctioned ([Bates et al., 2012](#)).

A critical mechanism through which deterrence operates in road policing is visibility. Visible enforcement increases drivers' awareness of police presence and can serve as a salient reminder of enforcement risk, reinforcing perceptions of certainty and therefore encouraging compliance with road rules. Research has consistently demonstrated that visible enforcement is associated with reductions in speeding and other risky behaviours, even when enforcement encounters are brief ([Bates and Anderson, 2019](#); [Freeman et al., 2015](#); [Simpson et al., 2023a](#)). Police vehicles represent the most prominent and frequently encountered form of visible enforcement presence, functioning as mobile symbols of police authority and enforcement capability.

Despite the importance of visibility in deterrence-based policing, limited research has examined how specific features of police vehicles, such as colour, markings, equipment and vehicle type, shape drivers' perceptions of enforcement risk. Existing work has tended to focus on the presence or absence of police, or on enforcement technologies, rather than on how drivers interpret the visual design of enforcement vehicles themselves (e.g. [Simpson, 2019](#); [Simpson, 2025](#)). This represents a critical gap. Drivers must first recognise and interpret a police vehicle as an enforcement threat before deterrence mechanisms can operate, and a vehicle perceived as unlikely to enforce traffic laws may fail to generate the behavioural response that visible enforcement is intended to produce. Understanding the relationship between police vehicle design, perceived certainty of intercept and punishment and driver behaviour is therefore relevant for both theory and practice.

The current study addresses this gap by examining how Queensland-licensed drivers perceive different police vehicle designs, particularly in relation to key deterrence concepts (certainty of intercept and punishment) and behavioural responses to seeing police vehicles. Three research questions guided the study:

- (1) How do drivers perceive different roles or focus of police officers based on the visual characteristics (e.g. colour, markings, equipment, vehicle type) of their police vehicle?
- (2) How do drivers describe visual elements of police vehicles (e.g. colour, markings, equipment, vehicle type) as it relates to their perceived certainty of apprehension and punishment?
- (3) How do drivers describe these perceptions in relation to their perceived impact immediate and sustained changes in behaviour (i.e. the halo effect) after encountering police vehicles?

Literature review

Road policing and deterrence theory

Road policing is a central pillar of road safety strategies, with a primary aim being to reduce road trauma (serious injury and fatal crashes) by deterring illegal driving behaviours (Australian Government, 2021; Bates *et al.*, 2012; Davey and Freeman, 2011). Through both proactive and reactive enforcement activities, road policing serves to reinforce road rules, protect road users and maintain safety on the road network (Hinkle *et al.*, 2020; Nagin, 2013). From a theoretical perspective, these functions align closely with deterrence theory, which posits the fact that individuals are less likely to offend when they perceive a high probability of apprehension and a meaningful punitive consequence (Paternoster, 2019).

Deterrence theory distinguishes three core dimensions that are proposed to reflect perceptions regarding the outcomes of engagement in illegal behaviour, including around the road. This includes dimensions of: certainty, referring to the perceived likelihood of apprehension; severity, referring to the perceived harshness of the punishment and swiftness, referring to how promptly punishment follows the offence (Paternoster, 2019; Raskolnikov, 2020, 2021). The overarching conceptualisation has distinguished concepts of specific and general deterrence. General deterrence aims to reduce offending among the broader population by shaping perceptions of enforcement risk and is most relevant to road policing. Specific deterrence instead targets detected offenders (Davey and Freeman, 2011; Nagin, 2013). Of the three dimensions, certainty of apprehension has been shown to exert the strongest influence on driver behaviour (Durlauf and Nagin, 2010; Nagin and Pogarsky, 2001). Any reduction in the perceived certainty of apprehension may therefore lead drivers to underestimate the likelihood of sanction and diminish compliance with road rules. Road policing activities are accordingly designed to increase the perceived risk of apprehension and sanction for traffic offending (Bates *et al.*, 2012).

This study distinguishes certainty of apprehension into two related constructs: certainty of intercept (the perceived likelihood of being stopped) and certainty of punishment (the likelihood of a sanction following intercept). This distinction acknowledges that a driver may believe they could be stopped by police, or particular police officers, without necessarily expecting to be penalised. Differentiating these concepts allows a more precise examination of how police vehicle design and visibility shape perceptions and behaviour.

Police visibility as a deterrence mechanism

Research shows that visible enforcement strengthens deterrence by increasing the perceived certainty, severity and swiftness of sanctions (Bates and Anderson, 2019; Bates *et al.*, 2017; Davey and Freeman, 2011; Freeman *et al.*, 2015; Truelove *et al.*, 2023). A visible police presence is associated with changes in driver behaviour, including reductions in speed (Megat-Johari *et al.*, 2021; Simpson *et al.*, 2023a). As drivers have limited time to detect and interpret enforcement cues, police vehicles serve as the primary means through which enforcement presence is communicated to road users, with rapid identification reinforcing the perception that violations are likely to be detected and sanctioned.

Police vehicle design and community perceptions

Police vehicles are more than just functional transport; they are symbolic representations of police authority, legitimacy and enforcement intent (Simpson, 2019). Across jurisdictions, police vehicle designs vary substantially in colour schemes, markings and mounted equipment, and these variations provide important context for understanding how police vehicles may be interpreted differently by members of the public.

Empirical research has shown that police vehicle design influences public perceptions of police officers and their intentions. In an experimental study conducted in Canada, Simpson (2019) found officers in marked vehicles were associated with more positive perceptions of legitimacy compared with those in unmarked vehicles, while unmarked vehicles were more

frequently associated with aggression and reduced approachability. Specifically, when comparing an unmarked vehicle with marked vehicles, participants rated officers in the unmarked vehicle higher on aggression and significantly lower on approachability, friendliness and accountability. More recent experimental work has also demonstrated that marked vehicles are detected far more frequently than unmarked vehicles, particularly under low-visibility conditions (Simpson, 2025), underscoring the importance of vehicle design in the context of recognition and interpretation.

Simpson (2025) used a visual detection exercise and found that high-contrast liveries provide a recognition advantage when vehicles are partially obstructed or observed at a distance. Qualitative research by Simpson *et al.* (2023b) highlighted that highly visible and identifiable features, such as bright and reflective colouring, are perceived as important for police vehicle visibility. However, limited research has directly examined how these designs affect drivers' perceptions of enforcement risk, particularly certainty of intercept, certainty of punishment and the duration of deterrence.

Marked police vehicles and driver behaviour

Research examining the behavioural effects of overt enforcement presence suggests that visible police activity can produce immediate changes in driver behaviour (Simpson, 2025; Simpson *et al.*, 2023a). Studies have found that drivers reduce speed and increase compliance in the presence of marked police vehicles, with behavioural effects often persisting for only a short duration after the police vehicles is no longer visible (Simpson *et al.*, 2023a). Direct research on the behavioural effects of marked police vehicles specifically remains limited; much of the available evidence draws on studies of overt enforcement operations more broadly, including mobile speed camera deployments. For example, Gouda and El-Basyouny (2017) found that overt mobile speed camera enforcement produces a limited "halo" effect on driver speeds, with factors like frequency and duration of mobile speed camera operations associated with the observed duration of behaviour change. While speed cameras are a distinct enforcement tool from marked police vehicles, both function as overt, visible signals of enforcement presence on the road and are theoretically grounded in the same certainty of apprehension mechanism. The extent to which findings from speed camera research generalise to marked police vehicles remains an open empirical question and one this study seeks to address.

Research gap and rationale for the current study

Existing research has examined road policing strategies such as random breath testing (RBT) [1], speed enforcement and high-visibility operations, and more recently, how police vehicle design shapes perceptions of police. However, police vehicle markings have traditionally served branding and identification purposes rather than being considered as a mechanism to achieve and sustain deterrence.

Methodology

Context

The study was undertaken in Queensland, Australia, the third-most populous state (approximately 5.7 million people as of 2025; Australian Bureau of Statistics, 2026), with a densely populated south-east metropolitan corner and large rural, remote and regional areas of lower density. In terms of road safety, Queensland's road fatality rate has consistently been above the national average (Department of Infrastructure, 2026), with more than 300 lives lost on Queensland roads in 2024 and 2025 and fatality rates of around 5.4 deaths per 100,000 persons, reflecting ongoing challenges across the state.

Like other Australian states, Queensland has only one policing agency that looks after all state-based law enforcement. Road Policing is undertaken through both general duties (GD)

and specialist traffic enforcement units within the Queensland Police Service (QPS). A range of QPS vehicles were selected for use within this study (see [Figure 1](#)) included GD policing vehicles (including one with a transportation pod on the rear), highway patrol (HWP) vehicles (including a marked HWP motorcycle), an unmarked vehicle and “QPS FATAL5” vehicles. GD, commonly referred to as “patrol” in North America’, are frontline police who have a primary role in responding to calls for service from the public. Highway patrol (formally called Road Policing Command [RPC]) are specialist police units that proactively targeted traffic offending. Unmarked vehicles are typically used by detectives. The QPS have “Fatal 5” campaign-liveried police vehicles as a high-visibility road safety initiative intended to capture



Figure 1. Images used during the study of various past and present Queensland police service vehicles

driver attention, promote safer behaviour and serve as high visibility enforcement driven by HWP officers that target the Fatal Five high-risk behaviours ([Queensland Police Service, 2025](#)); speeding, drink and drug driving, distractions, fatigue and seatbelts.

Participants and recruitment

Forty Queensland-licensed drivers aged 18 years and over were purposively recruited to capture variation in age, gender and location (metropolitan, rural, regional areas of Queensland). Participant location was classified using the Accessibility/Remoteness Index of Australia Plus (ARIA+; [Australian Bureau of Statistics, 2023](#)) based on residential postcode provided by participants. Expressions of interest (EOIs) were obtained via social media, directing respondents to a Qualtrics survey for eligibility screening and consent form. Participants were selected from those who met eligibility criteria based on age, gender and location to ensure variation across the sample. EOIs matching required eligibility groups were invited for an interview, with 40 included in the final sample. Participants reconfirmed their consent to participate at the beginning of the interview. A \$20 e-gift card was offered to participants who completed the interview, as a token of appreciation. This study received approval from the University Human Research Ethics Committee (Approval No. A242134).

Procedure and measures

After providing consent and contact information, participants were contacted by a research team member to schedule an interview via Microsoft Teams. Interviews lasted 33 min on average (ranging from 18 to 56 min). While reconfirming consent to participate in the interview, consent to record the interview was also obtained. Audio recordings of the interviews were then transcribed verbatim by an external transcription service. Recruitment continued until purposeful recruitment targets and thematic saturation was reached, defined as the point at which no substantively new themes relevant to the research questions were identified in successive interviews.

The semi-structured interviews explored perceptions of police vehicle design and deterrence. Participants first described police vehicles and their visual features (e.g. type, colour, decals, equipment). Participants were then asked about police vehicle designs related to their perceived certainty of intercept and punishment and impact that observing a police vehicle had on their driving behaviour.

In the next section of the interviews, participants were shown photographs of different police vehicles (see [Figure 1](#)) and asked to score their certainty of intercept and punishment using a Likert-type scale from 1 (not at all likely) to 10 (highly likely) based on their observations (and experiences if any) of the vehicle in the images. Following the rating, they were asked to describe their reasoning for the rating. Additional questions also probed whether the presence of each vehicle would change their driving behaviour and for how long they believed that observing this vehicle while driving would have an impact on their behaviour.

Data analysis

Transcripts were analysed thematically ([Braun and Clarke, 2006](#)) using a largely deductive approach guided by deterrence theory and the research questions. Qualitative data analysis software (Nvivo 20) was used during the coding process. An initial structured coding framework was developed deductively to capture key theoretical constructs relevant to road policing deterrence, including certainty of intercept, certainty of punishment, vehicle visibility, perceived enforcement role, immediate behavioural change and duration of behavioural impact (halo effect). All transcripts were coded using this framework. During coding, sub-themes were identified. An example of the sub-themes within certainty of punishment included perceptions of leniency versus strict enforcement, education-focused

versus enforcement roles of police based on their vehicle. Sub-themes were generated through repeated patterns in participant interviews.

Themes were refined collaboratively by the research team and a subject-matter expert who did not conduct the interviews to ensure objectivity. Interpretations were compared through analytic discussion, with disagreements resolved iteratively until sub-themes were cohered and distinct. Illustrative quotes are provided to demonstrate the grounding of themes in participant responses.

Along with the participant characteristic information, two interview questions were quantitative in nature, with certainty of intercept and certainty of punishment being measured on a 10-point Likert-type scale. Mean scores for each scale were calculated for descriptive comparison across the eight vehicle images presented to participants. These descriptive statistics were computed manually. No inferential statistical analysis was conducted, consistent with the exploratory nature of the study.

Results and discussion

Participant characteristics

Forty Queensland-licensed drivers participated in the study, distributed across age groups (18–24, 25–49, 50+; see Table 1) and locations (62.5% metropolitan, 37.5% regional). Most were male (62.5%). Just over half (52.5%) had received an infringement in the past five years, with more detected by cameras (57%) than police (43%). Police intercepts (excluding for the sole purpose of RBT) were reported by 28% in the past year and 40% in the past five years; 38% had not been stopped in over five years, and 23% had never been stopped. Nearly half (45%) had been stopped for RBT in the past year.

Visual identification of police vehicles

Visual identification of police vehicles was the first topic covered during the interview. Without visual stimulus, participants consistently described relying on visual cues to identify police vehicles while driving. Markings, lighting and visible equipment were commonly cited as the primary features that enabled drivers to recognise a vehicle as belonging to police and to distinguish between different types of police vehicles.

Table 1. Participant characteristics

Category	Variable	N	%
Gender	Male	25	62.5%
	Female	14	35.0%
	Other	1	2.5%
Age	18–24	12	30%
	25–49	14	35%
	50+	14	35%
Location	Metropolitan	25	62.5%
	Regional/Rural	15	37.5%
Offending/History	Infringements (Last 5 Years)	21	52.5%
	Police Issued Infringements ^a	9	42.86%
	Camera-Detected Offences ^a	12	57.14%
Intercepted by Police	Within 12 Months	11	27.5%
	Within 5 Years ^b	16	40%
	More than 5 Years	15	37.5%
	Never	9	22.5%
Intercepted for RBT	Within 12 months	18	45%

Note(s): ^aPercentages are calculated based on the number of participants who reported having received an infringement notice, ^bIncludes those who have been intercepted by police within the last 12 months

Markings. Participants described police vehicle markings as central to identification with high-visibility markings such as blue and white checkers combined with bright contrasting striping in yellow, orange, red or blue were repeatedly referenced as the primary cue signalling that a vehicle was police. Prominent liveries, reflective or “iridescent” striping, and large, legible text such as “POLICE,” “Highway Patrol,” or “Road Policing Command” were also described as increasing both recognisability and perceived enforcement certainty. Several participants also suggested that bold decals or explicit messaging (e.g. camera warnings or road safety slogans) would further enhance salience and perceived enforcement presence.

I would expect to see the lights on them, and the police banner, so the black and– sorry, the blue and white checkered stripes along the side. I think they have the word “police” on them somewhere? – P24 (Female, 18–24, Regional)

Collectively, the findings indicate that conspicuous, high-contrast markings function as a key visual heuristic through which drivers identify police vehicles. This interpretation aligns with prior experimental research demonstrating that marked vehicles are more readily detected and recognised than unmarked designs, particularly under low-visibility conditions (Simpson, 2019, 2025), and with work highlighting the importance of distinctive visual components such as contrasting colour schemes and reflective elements in facilitating rapid categorisation (Thomas and Williams, 2012).

Lighting and visible equipment. Participants discussed a range of lighting and enforcement hardware they have observed attached to police vehicles. Emergency lights, particularly red and blue roof-mounted lightbars, were seen as key features drivers use to identify police vehicles. Some participants noted that these lightbars were highly recognisable from a distance and they described immediate behavioural changes, including one participant who stated:

The light bar, a couple of hundred meters and you’ll recognise that. – P28 (Male, 18–24, Regional)

In addition to lighting, participants were asked if there was any equipment on the police vehicles that, if present, would increase their perceived certainty of intercept or punishment. A number of participants highlighted the importance of speed detection devices and cameras, with some specifically mentioning the visibility of automatic numberplate recognition (ANPR) cameras, radars or antennas as contributing to perceptions of traffic enforcement capability of police vehicles.

I’m not as pedantic around them [white general duties police vehicles] as I would be with speed if I was seeing a Highway Patrol coming my way, because I feel that they’d have their [speed detection] radar on the whole time – P29 (Female, 50+, Regional)

These responses suggest that both emergency lighting systems and the presence of specialised devices that assist the police in the detection of traffic offences can reinforce the visibility and perceived capability of police vehicles to enforce the road rules, potentially enhancing their deterrent impact. This finding is supported by previous research that identified lightbars as key identifiable features of a police vehicle (Thomas and Williams, 2012). However, the current study extends beyond emergency lighting equipment to the recognition of specific enforcement equipment, such as speed detection devices and onboard cameras (such as ANPR), which for some drivers elevates the perceived traffic enforcement capability of that police vehicles.

Perceived operational role and enforcement capabilities

Beyond recognising police vehicles visually, participants made inferences on the operational role and enforcement focus of police vehicles based on their appearance.

Colour and markings. When it comes to the colour of the police vehicle, the base colour was often discussed as a way that participants identify the role of the police within the vehicle. White police vehicles were consistently associated with GD policing and often perceived as

less likely to enforce the road rules, with participants distinguishing these from more vibrantly coloured or purposefully marked HWP vehicles. Contrasting and high-visibility police markings (particularly the checkered pattern) were frequently discussed as key identifying features of police vehicles. One participant stated:

I'm assuming most people would know a generals [GD police vehicle] is usually white whereas the traffic cars usually are coloured cars . . . – P37 (Male, 18–24, Regional)

I think white is more, to me in my head, more run-of-the-mill everyday on the beat cops, who will probably give more of a warning than probably the coloured cars. Obviously they're coloured for a reason. They mean business. I'm not so worried about white police cars. – P02 (Female, 25–49, Metro)

These results suggest that participants perceive police vehicle colour and markings as strong indicators or visual cues of the role of a police vehicle. White cars were commonly seen as GD vehicles, while brightly coloured or distinctively marked vehicles were viewed as traffic enforcement-focused. Such findings are supported by previous work on police vehicle design which has demonstrated that variations in colour and marking are associated with perceptual differences by members of the public (Simpson *et al.*, 2023b; Thomas and Williams, 2012).

Vehicle type and role attribution. Many participants associated specific vehicle types (shape or make/model, including unmarked or less conventional vehicles such as those with a transportation pod) with particular policing functions, often describing them in terms of their overall build, style and perceived function. Sedans and marked sports utility vehicles (SUVs) were commonly recognised as GD vehicles, while sports cars (such as the Kia Stinger) and police motorcycles were recognised as having a traffic enforcement focus. Participants discussed how they perceived high-visibility vehicles as more authoritative and, therefore more effective in influencing their behaviour.

The highway patrol is more end up trying to get speeding people as opposed to just general doing the rounds . . . I would know that they were out there for that purpose, and (it) would make me a bit more cautious. – P13 (Male, 18–24, Metro)

One of the most consistent perceptions related to vehicle type held by participants, was that police officers on motorcycles were overwhelmingly associated with having a road policing focus and only in rare cases would do any other policing duties. Participant descriptions of police motorcycles indicated that due to their agility, manoeuvrability and interception capabilities, they associated them with dedicated traffic enforcement roles:

They're fast, they're quick, they can get you and be on to the next one in a flash. Regardless of what you're doing, they're always going to outrun you. They don't have a good reputation, by the way, for being kind and soft and gentle. It's often said that motorbike cops would book their own mother. I think it's true – P10 (Male, 50+, Metro)

Unmarked or less conventional vehicles (e.g. utility vehicles) were often seen as harder to identify compared with other police vehicles and often associated with duties other than traffic enforcement. However, there were two overall considerations with regard to unmarked vehicles. The first and most common theme was that they believed the unmarked vehicles were used by detectives, who are typically responsible for investigating more serious crimes, who would have little to no interest or time to conduct GD policing or detect and punish traffic offending.

Well, I know there are vehicles like this that patrol around the roads due to previous experience, but it also makes me think that it's containing detectives or some people like that who are on their way to solving a crime or investigating a crime, some murder or something like that rather than bothering with road traffic stuff. – P20 (Female, 50+, Regional)

Well, one would assume that it'd be plainclothes police, like the CIB (Criminal Investigation Branch [Detectives]) or something like that or detective sort of thing . . . they probably haven't even got a

ticket book if they're CIB or whatever. If they did pull you over, you've probably more chance of just getting a caution or a warning . . . – P17 (Male, 50+, Metro)

However, other participants discussed unmarked police vehicles that are operated by the HWP and in that case, they perceive the focus of those unmarked vehicles as having a dedicated traffic enforcement role where they can covertly detect and punishing traffic offending.

If they're unmarked traffic, then they're like Highway Patrol, but just without the obvious markings to catch more people. – P29 (Female, 50+, Regional)

. . . it is unmarked, so they are out there trying to catch people off guard doing the incorrect things on the road. – P16 (Male, 18–24, Metro)

A number of participant quotes highlighted this dichotomy of views between the use of unmarked cars by detective or GD officers and the HWP or traffic focused officers stating:

I don't know if it would be unmarked detectives, or whether it would be unmarked traffic. If it was more the traffic branch, I would think they would definitely pull you over. If it was unmarked detectives, then they would obviously be investigating a crime, and probably couldn't be bothered, and have their monitoring gear working. – P29 (Female, 50+, Regional)

If it's a detective, they don't write tickets. If it's a uniform [GD officer], they might, and it only depends if they're really on a traffic operation or not. If it turns out it's an unmarked traffic branch car, then yes, you definitely get a ticket then. – P30 (Male, 25–49, Metro)

The perception of operational role attribution was particularly evident in participant discussions of police vehicles designed for the transport of persons in custody. A majority of the participants discussed the role of the paddy wagon (a term used to describe police vehicles with purpose built modules for the transport of a person in police custody) as a transport vehicle, and indicated that transport was its primary role and would be almost exclusively for that task.

I feel like the reason why they're on the road is actually for a purpose of transport rather than monitoring and normal patrol. Yes, I feel like they're actually on the way to something or have a purpose for their travel. – P09 (Female, 25–49, Metro)

Being a paddy wagon, so the suspect transport, whatever you want to call it, just because they're usually going to be doing something else . . . so they're not going to be focused on traffic enforcement unless you're doing something ridiculous – P37 (Male, 18–24, Regional)

These findings indicate that participants describe a form of visual profiling that occurs on the road while driving, categorising police vehicles based on observable characteristics (such as their size and perceived speed) to assess their likely role and the probability that they will enforce traffic laws. In a road policing context, these perceptions around police vehicles can serve as a visual clue to the enforcement focus and capability of police (such as specific HWP vehicles) which, based on the literature, may influence the certainty of punishment perceived by drivers and thus the deterrent effects (Truelove *et al.*, 2017), with motorcycles functioning as a symbol of highly capable and dedicated traffic enforcement vehicles. The current study extends Simpson (2019) and Thomas and Williams (2012) by demonstrating that vehicle type, make and model recognition are linked not only to the perceptions of police occupying those vehicles, but also the perceived enforcement capabilities.

Different interpretations of vehicle messaging. A unique design of some Queensland Police vehicles, FATAL5 vehicles, elicited mixed responses from participants, with some drivers perceiving them as highly recognisable and strict on the enforcement of the road rules (much like HWP cars), other participants perceived that their main purpose may be more educational or focused on communicating road safety messages and therefore more likely to give warning for traffic offences. Participants who believed the FATAL5 police vehicles were likely to be strict and there was very little chance of avoiding punishment for traffic offending include:

I suppose just the stickers and that on it, the distraction, seatbelts, drink driving, all that type of thing. It looks like they are patrol cars out to try and find people doing the wrong thing or engaging in the FATAL5 things – P14 (Male, 25–49, Regional)

It looks like a road [policing] vehicle. Then plus, they’ve got all these warning things on them. It’s like a no-excuses thing, sort of, We’re telling you, stop doing all this. – P39 (Female, 50+, Metro)

Whereas example quotes from participants who believed that the police vehicles with the FATAL5 design were education-focused or more likely to give out warnings stated:

... I don’t know whether they would be more inclined to give you a fine or try and educate you on the dangers of what you’re doing. – P02 (Female, 25–49, Metro)

I think the design of these cars makes me feel like they’ll be wanting to take an educative approach to a roadside stop rather than just issuing the fine, even though they may still do that, but they’ll certainly take that educative approach as well. – P05 (Male, 18–24, Metro)

While the intent behind the FATAL5 vehicle design may be to communicate a clear road safety message, the divergent interpretations among participants suggest that these designs have the potential for conflicting effects on perceived certainty of punishment. For some drivers, the prominent messaging about high-risk behaviours reinforced the impression that these vehicles were actively targeting traffic offences, thereby heightening the perceived likelihood of apprehension and punishment. For others, however, the same messaging appeared to soften the perceived punishment role, instead aligning it more with education, community engagement or public awareness campaigns. As such, policing organisations need to be cognisant of the visual design of police vehicles, especially when incorporating additional messaging, as it may inadvertently dilute the clarity of punishment purpose behind the vehicle.

Perceived certainty of intercept and punishment

Participants’ interpretations of police vehicle roles were closely linked to their perceived certainty of being intercepted and punished for traffic offending. Ratings of CoI and CoP (see Figure 2) consistently associated the highest perceived deterrence with specialist enforcement vehicles (HWP Stinger, HWP Motorcycle), with the HWP motorcycle rated highest and described as highly agile, fast and traffic enforcement-focused:

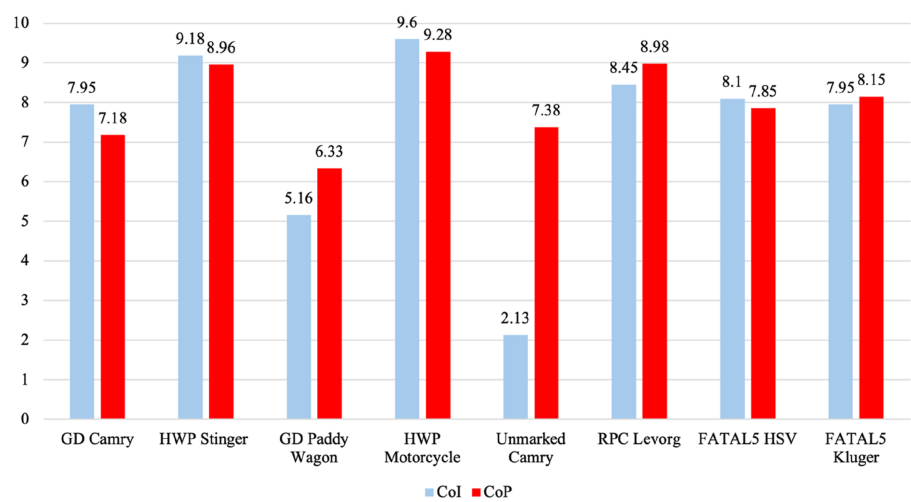


Figure 2. Certainty of intercept and punishment by police vehicle

They're fast, they're quick, they can get you and be on to the next one in a flash. Regardless of what you're doing, they're always going to outrun you . . . They're paid to do the job and got no issue with it. I've got no doubt if they catch you, you're gone. They don't pull you up unless you're doing something wrong, these guys. – P10 (Male, 50+, Metro)

(A) police bike doesn't get much more Highway Patrol than this. Everyone can see a police bike and they recognise that they are usually harsher, stereotypically. You're not getting away from this one. – P28 (Male, 18–24, Regional)

Participants had mixed perceptions about GD police vehicles, with the GD Camry scoring higher for CoI compared to CoP. This relates back to the perceptions held around the operational role of the vehicle, that is, a GD vehicle may intercept you for a traffic offence, but it is less likely to issue an infringement during that traffic stop with participants stating:

It's general duties. It's a Toyota Camry, so just plain Jane sort of thing . . . I'm guessing it depends on the fine and what the offence was, but it's unlikely [certainty of punishment if intercepted]. – P35 (Male, 25–49, Regional)

Inversely, participants suggested the GD Paddy Wagon and the Unmarked Camry are unlikely to intercept, however, an offence serious enough to trigger one would likely to result in a punishment.

I tend to feel like when police are out in these cars that I feel like they're typically dealing with or traveling– they might be traveling between jobs or call-outs or back to the station . . . If I'm going 120 in a 60 zone or if I've just not used an indicator when I've gone around a turn, I think there's a little bit, it would depend a bit on what the actual [offending] behaviour is. – P05 (Male, 18–24, Metro)

When it came to the use of police motorcycles, there was a consistent view that these vehicles were only for traffic enforcement and had no other operational policing role which means that their sole purpose is to intercept and punish offenders. This perceived focus was somewhat shared with the HWP Stinger and the RPC Levorg which also score highly for certainty of intercept and punishment, however possibly due to the agility and manoeuvrability of the motorcycle, scored slightly higher compared to the vehicles. Some of the quote discussing the certainty around motorcycles, HWP Stinger and the RPC Levorg include:

I believe motorbike police are more road safety focused, like they drive down between cars to check if people are using their phones when stationary at a stoplight and stuff like that. Motorbikes designed to go fast, catch up to cars and stuff like that. – P02 (Female, 25–49, Metro)

I know the highway patrol just seemed to be a bit more, not forceful, so to speak. From experience I've had in the past, it's more the highway patrol that aren't as lenient as another police car would be. – P27 (Female, 50+, Regional)

. . . so they're road policing command [RPC Levorg], and that's their job, is to enforce traffic rules. That's their main glaring job. – P33 (18–24, Male, Metro)

By consistently associating the visibility of HWP vehicles and the agility of motorcycles with heightened levels of certainty regarding interception and punishment, these findings suggest that the design and function of police vehicles can alter driver perceptions and their behaviour. However, when it came to the FATAL5 vehicles, as discussed above, there was some varied perceptions around their operational role and whether their purpose was as an enforcement or an educational vehicle.

I'd probably say, about a three [out of 10 for CoP], just because it [Blue FATAL5 Vehicle – Image 8] gives the message that it's more meant to be educational. I feel like you're more likely to get a warning, unless you've got a history of doing that particular offense, or you're doing something really bad. – P11 (Male, 18–25, Metro)

It [Yellow FATAL5 Vehicle- Image 7] looks more showy than anything, as if to get a message out, rather than be a working car. I would say, it'd be more educational/warning, I would hope. I would say,

maybe there's a 50/50 chance. Depends on if they're about education, or if there's no tolerance, which is understandable. – P29 (Female, 50+, Regional)

These insights suggest that drivers form some assumptions about the likelihood of being intercepted or punished by police for traffic offences, based on the design and markings on the police vehicle they observe. However, road safety campaign markings (FATAL5) on enforcement vehicles are interpreted differently by drivers, and when these markings shift the perceived operational role of the police vehicle to educational rather than enforcement-focused, it may reduce the vehicle's deterrent effect, with potential unintended consequences for deterring traffic offending. Consistent with the general deterrence theory (Nagin and Pogarsky, 2001), and with prior work demonstrating that visible and clearly identifiable enforcement enhances perceived risk (Simpson, 2019; Simpson *et al.*, 2023a), these findings suggest that ambiguity in operational messaging may attenuate the perceived certainty of sanction.

Immediate behaviour responses to police vehicles

There was a consistent theme reported by a majority of the participants that seeing a police vehicle triggered an immediate change in their driving behaviour. This response was particularly evident when encountering highly visible or traffic enforcement focused vehicles, such as HWP cars and motorcycles. Commonly reported behavioural changes included reducing speed, checking mirrors, increasing following distance and generally driving more cautiously.

Even if you're doing the right speed limit, everyone slows down about 5, 10 kilometres, I think just for the sake of you hope to not even get noticed by the police when they drive by.- P22 (Unknown, 18–25, Metro)

I think as soon as you spot an actual marked police vehicle, that's when you'd change your driving behaviour. It's quite common for people to slow down and do like 5ks under when you're on the highway anytime they're around one. – P30 (Male, 25–49, Metro)

These findings align with deterrence theory, which posits that increased certainty of apprehension, that would result from the presence of police vehicles, serves as a mechanism that deters drivers from committing traffic offences, increasing compliance with the road rules (Nagin and Pogarsky, 2001; Truelove *et al.*, 2021). Police vehicles such as motorcycles and HWP vehicles were described as eliciting stronger behavioural shifts due to their perceived agility and their operational focus on traffic enforcement. Participants stated:

If you pass the highway patrol, it's usually check your speed, as in more alert to traffic conditions or your manner of driving, whereas if you pass a general's car, they're only going to a job. It's not effective as much as a traffic car. – P35 (Male, 25–49, Regional)

These findings underscore the importance of highly visible police vehicle designs and distinct traffic-enforcement focused markings and vehicles, such as HWP cars and motorcycles, in shaping driver behaviour. Many participants reported that vehicles clearly associated with traffic enforcement elicited more immediate and pronounced behavioural adjustments, particularly reductions in speed, cessation of any other offending (mobile phone use) and increased vigilance. These findings are consistent with core principles of deterrence theory, which includes the perception or threat of punishment reduces the likelihood of individuals engaging in undesirable behaviour (Gibbs, 1968; Paternoster, 2019).

Of interest, not all police vehicles are perceived equally on the road with regard to the enforcement risk they pose; rather, it is the salience of enforcement-specific visual cues that amplifies the perceived certainty of apprehension. These results also align with traditional enforcement strategies and road safety countermeasures that are grounded in deterrence theory, particularly the notion that perceived certainty of being apprehended and punished by

police may be a key factor of driver compliance with the road rules (Nagin and Pogarsky, 2001; Nagin *et al.*, 2015; Truelove *et al.*, 2021). The results also align with broader policing research suggesting that enforcement is most effective when it is seen as problem-oriented, targeted, and specific (Hakkert and Gitelman, 2005; Hinkle *et al.*, 2020; Reisig, 2010). These findings have practical implications for police vehicle design and deployment strategy, highlighting that enhancing the visibility and recognition of police vehicles, especially those associated with traffic enforcement, can play a critical role in promoting safer driving behaviours through situational and vicarious deterrence.

Duration of behavioural impact (halo effect)

While participants described an immediate behavioural change in the presence of a police vehicle, they also commonly reported that these behavioural adjustments were temporary, and in most cases, lasting only as long as the vehicle remained visible. Once the police vehicle was passed or out of sight most participants acknowledged that their driving returned to their previous behaviour within a short time frame.

A couple of minutes I think until the police car was out of sight. – P05 (Male, 18–24, Metro)

Just once it's out of sight, you'd probably go back to however you were driving – P22 (Unknown, 18–24, Metro)

In contrast, highly visible traffic enforcement-focused vehicles, particularly HWP cars and police motorcycles, were discussed as influential. Participants frequently noted that the behavioural changes initiated upon seeing these vehicles often persisted well beyond the initial encounter, for a longer duration compared with GD police vehicles and with some of the participants reporting that the effect persisted for the remainder of their journey that day.

I think similar to the Kia Stinger [a Highway Patrol] car. You'd wait a little bit longer even after it's out of sight. You might check your rear mirrors still to see if it's just coming back around. – P22 (Unknown, 18–25, Metro)

... it would change my driving, and I'll be watching what I was doing for the rest of the trip. – P27 (Female, 50+, Regional)

Probably a bit longer [compared to other police vehicles shown]. These people on motorbikes give you the impression that they're much more mobile than the other vehicles. If you were going the opposite way and speeding, it wouldn't be much of a bother for him to turn around and chase you, whereas it might be for the other ones. – P20 (Female, 50+, Regional)

The change in behaviour (primarily less speeding) that was described when participants viewed images of HWP vehicles and motorcycles can be understood as a stronger and more sustained halo effect. Gouda and El-Basyouny (2017) found that repeated exposure to overt enforcement operations can prolong the deterrent effects. In the current study, the interpretation of the vehicle, based on the visual assessment of the vehicle and its markings, as having a traffic enforcement role was associated with descriptions of longer deterrence. HWP cars and motorcycles were described as having “*no leniency*” and that “*their main job, it's to enforce traffic*”. These findings appeared to reinforce participants' higher certainty of apprehension and, thus, potentially reducing the likelihood of drivers resuming their traffic offences (a greater halo effect).

The findings of this study suggest that traffic enforcement specific police vehicle types, with a higher certainty of apprehension and punishment, not only produce stronger immediate behavioural changes but also extend the duration of compliance, consistent with deterrence theory (Freeman *et al.*, 2015; Nagin and Pogarsky, 2001; Piquero and Pogarsky, 2002). From an operational perspective, this highlights the importance of visible, recognisable traffic enforcement police vehicles for sustaining safer driving behaviours beyond the moment of direct observation by a driver.

Limitations and future research

This study offers novel insights into how drivers describe police vehicle design and its relationship with perceptions of enforcement capability, certainty of apprehension and punishment. Several limitations should be noted. First, the study used a mostly qualitative design with 40 purposively sampled Queensland-licensed drivers where we cannot determine response rates (given social media recruitment). Although diversity across age, gender and location was sought, the small, non-random sample limits generalisability. Second, limitations arise from the vehicle types shown to participants and their familiarity with them. A range of QPS vehicles was included (e.g. GD, HWP cars and motorcycles, unmarked and FATAL5 designs), but prior knowledge or experiences likely shaped perceptions. As [Simpson *et al.* \(2023b\)](#) suggest, unfamiliar or ambiguous designs may weaken deterrence. Finally, the study relied on self-reported perceptions and behavioural intentions from semi-structured interviews. These methods may be affected by recall bias or social desirability, with some participants potentially overstating compliance or the deterrent influence of police vehicles despite confidentiality assurances.

Future research should employ larger, more representative samples, potentially incorporating stratified sampling to capture variation across demographic groups, driving experience and prior contact with police. To address concerns regarding the familiarity of participants with the police vehicles displayed, future research could explore these dynamics further by systematically comparing perceptions of known versus unfamiliar police vehicle designs, including cross-jurisdictional studies where police fleets and markings differ. Furthermore, an experimental trial of the impact of various police vehicle designs could be conducted (using a similar methodology to [Simpson *et al.* \(2023a\)](#)) to determine the impact of various police vehicles on driver behaviour, including different driver behaviours.

Conclusions

This novel study found that police vehicle designs are described by road users as having an impact on their certainty of intercept and punishment, and importantly, their behaviour as a driver. The results explore how drivers identify and differentiate between police vehicles based on visual cues (colours, markings, equipment and vehicle type), assigning specific roles and enforcement capabilities that directly impact their perceived certainty of apprehension and punishment. In doing so, the study extends deterrence theory by highlighting that certainty is not derived solely from police presence, but from how enforcement capability is perceived by road users. Critically, specialist or traffic enforcement-focused vehicles, in this case, motorcycles and HWP cars, particularly as bright and visible vehicles were rated and described as having substantially higher deterrent effects and extended behavioural compliance compared to general policing vehicles. The findings refine the deterrence theory by showing that targeted, recognisable traffic enforcement amplifies both immediate and lasting deterrent effects, highlighting the importance of enforcement salience and perceived certainty beyond what a generalised police presence achieves.

For policing organisations, these findings suggest that vehicle selection and design decisions can serve as force multipliers, maximising the deterrent impact of a limited police resource. This study also highlights the potential consequences of certain design choices, such as educational messaging that may inadvertently signal leniency or a diminished enforcement focus, possibly undermining the deterrent effect achieved regardless of the role of the vehicle in enforcement activities.

Importantly, this does not mean such a duality in designs are ineffective. Rather, from a deterrence perspective, the findings suggest the need for clear and consistent public messaging. HWP officers can and do play dual roles within the road safety space, enforcing road laws while also communicating and educating the public on vital safety messages their enforcement interaction and other community-policing activities ([Anderson *et al.*, 2020](#)). To address this, policing organisations opting for vehicle designs with additional messaging

should accompany these vehicles with broader media engagement strategies that clarify the purpose of the messaging, preserving the educative value of these designs while ensuring their enforcement capabilities remain prominent in the minds of drivers.

As police agencies face increasing pressure to demonstrate efficient resource allocation and measurable crime prevention outcomes, this research offers evidence to support policy that optimises police vehicle fleets. Aligning police vehicles and their livery designs with clear enforcement objectives, supported by communication strategies that reinforce their role on the road, may enhance both public safety and organisational effectiveness through the application of the deterrence theory and problem-oriented policing principles.

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Note

1. Random Breath Testing (RBT) is a legally authorised roadside enforcement strategy used throughout Australia that allows police to stop drivers without prior cause to administer a mandatory breath test for alcohol (Ferris *et al.*, 2013). Designed as a general deterrence mechanism, RBT operates through high visibility, high-volume testing and the perceived certainty of apprehension rather than selective suspicion-based stops.

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