



**Identifying approaches to address the hoon
behaviours of drivers in local communities and any
newly identified motivations behind the behaviour**

**Final Report to the Department of Transport,
Victorian State Government**

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EXECUTIVE SUMMARY

Background

Hooning is antisocial behaviour that poses varying levels of risk. These behaviours are attributed to a small number of road crash fatalities and serious injuries. Yet the potential risks to drivers, passengers and bystanders are considerable. Crashes resulting from hoon behaviours are less likely to be reported, making it difficult to quantify the full scale of the problem. However, there is evidence for an association between greater levels of hoon behaviours and increased hoon-related crashes.

Hoon behaviours can cause unnecessary noise and be perceived by communities as threatening, leading to a deterioration of the community's sense of safety and security. The COVID-19 pandemic restrictions saw an apparent increase in hoon behaviours suggested to have been motivated by stay-at-home orders and empty roads which reduced the perceived risk of being detected for engaging in risky behaviours.

This research project is part of a larger project being delivered under Victoria's Road Safety Strategy 2021 – 2030 that aims to implement new initiatives to reduce the prevalence of high-risk driving behaviour on Victorian roads. The findings of the project will support the work and recommendations to Government on options to enhance and support the deterrence of hoon behaviours as well as support the community-led action plans.

The Victorian Department of Transport (DoT) contracted the Queensland University of Technology (QUT) Centre for Accident Research and Road Safety – Queensland (CARRS-Q) to undertake a literature review and consultations with Australian jurisdictions regarding hoon behaviour interventions.

The aims of the project were to determine approaches, including interventions and legislative treatments, to address hoon behaviours with a particular focus on Australia and what has been effective and ineffective in reducing these behaviours. A secondary aim was to investigate the motivations and associated factors contributing to hoon behaviours.

Methodology

A systematic review of Australian and international peer-reviewed and grey literature was conducted. There were 1,833 papers identified in the search and an additional five papers from a scan of relevant papers. These papers were subject to a preliminary review, with those that described, reviewed, or evaluated hooning interventions or factors associated with hoon behaviours included in the final review.

Consultations with Australian jurisdictions were conducted. In addition to the two jurisdictions identified by DoT for consultation (Brimbank and Logan City Councils), 16 Australian jurisdictions were identified during the review that have implemented hooning interventions. These Councils were proposed to DoT as additional jurisdictions for consultation with two confirmed: Adelaide (Playford) and Randwick Councils. The aim of the consultations was to understand what interventions had worked and what had not worked, community sentiment, and the outcomes of the initiatives. The project was reviewed and approved by the QUT Human Research Ethics Committee.

Results

Literature review

Australian and international literature that included legislative treatments or interventions to address hoon behaviours were reviewed separately to be able to identify relevant jurisdictions for consultation. Fourteen studies were identified in the Australian literature and 22 international papers. Despite the broad timeframe applied to identifying literature, there has been limited Australian-specific research conducted in regard to legislation and other interventions that address hoon behaviours, with the most recent study conducted in 2015. Australian studies that have examined the legislation (which differs by state) found (a) impoundment and forfeiture laws are considered severe, (b) intention to hoon decreases in response to legislative changes, albeit the effect on actual behaviour was less, (c) hoon drivers will avoid police rather than face forfeiture of their vehicle, (d) legislation is not effective as a deterrent of first offences, rather of subsequent offences with the associated costs rating as the strongest deterrent, and (e) targeting hoon behaviours via legislation has an additional effect on other traffic offences. There is limited evidence in the literature to suggest legislation that targets the organisation and observation of hoon behaviours has been effective, however, in NSW there was a reduction in hoon events immediately after introducing the legislation. Impoundment legislation in international jurisdictions has been successful only when there has been visible enforcement with some research finding a reduction in road crashes, however, the findings have been mixed.

Literature identifying interventions beyond legislation to curb hoon behaviours included enforcement efforts, education and engagement, and engineering initiatives. There are limited evaluations of many of these initiatives. Enforcement efforts have been perceived as an ineffective deterrent as hoon behaviours and events are planned carefully to avoid detection by police, despite that the most likely method hoon drivers believe they would be caught is via police patrol. Hoon drivers shift locations in reaction to enforcement efforts. However, large, targeted operations by police have been known to cease the functioning of hoon clubs. There is no conclusive evidence to support whether covert or overt enforcement is more effective than the other. Community engagement efforts by police have had mixed reactions including perceived bias in targeting car enthusiasts. Hoon hotlines, despite the number of relevant calls received, are also debatable in effectiveness with hoon drivers perceiving this method the least likely they would be apprehended. National and international initiatives to create a safe place to hoon are not considered effective with the costs of attending such events limiting attendance. Additionally, the motivations for hoon behaviours, such as the thrill of engaging in illegal behaviours, are removed when attending these safe locations. Engineering efforts that have been evaluated predominantly focus on reducing excessive speeding. Signage, traffic calming (e.g., speed humps, regenerated urban space), and skid-resistant road treatments all have mixed results in the studies and as identified with enforcement, are more likely to shift the location of hoon behaviours rather than act as a deterrent.

Motivations and other factors associated with hoon behaviours were classified into four groups: demographics and personal factors, environmental, COVID-19 and hoon-related crashes. Sixty relevant papers were identified in the literature ranging 2002-2021. Male and younger drivers have been consistently found to be the largest proportion of hoon drivers. There is an association found with a low-risk perception and tendency to engage in multiple forms of risky behaviours, typical of young male drivers more generally. Hoon drivers range from being middle-class to working class to unemployed, lacking education, and from low socio-economic areas, dependent on the jurisdiction. Some hoon behaviours have been found to be influenced by thrill-seeking needs, such as stunt driving, however, there are stronger and more consistent findings reflecting hoon behaviours to be attention-seeking behaviours, that is, a spectator-driven behaviour.

The road environment has been found to be encouraging of hoon behaviours with open spaces away from heavily populated areas found to be common locations. Late night and other strategies to avoid police are factored into when and where hoon drivers perform. The few reported increases in hoon behaviours during COVID could be attributed to reduced enforcement by traffic police and empty roads. There are mixed findings regarding the level of crash risk associated with hoon behaviours. One reason was identified as under-reporting to avoid legal repercussions.

Consultations

Four interviews were conducted with council and police officers. Jurisdictions differed in their approach to addressing hoon behaviours with some working closely with police and others distinguishing the role of police from council's role. By-laws with substantial fines for hoon drivers and spectators were reported to be successful albeit hoon behaviours shift to neighbouring jurisdictions where the by-laws do not apply. Community engagement was identified by jurisdictions as critical to introducing legislation and road engineering approaches to reduce hoon behaviours. When consulted, communities have supported changes. There was a consistent theme that hoon behaviours shift according to enforcement and legislation. Engaging directly with hoon drivers and organisers of events was reported to be challenging.

Engineering efforts were suggested to be location dependent, including needs of local community. Islands and other traffic calming initiatives can be successful. It is important to understand the types of hoon behaviours that are engaged in on the targeted roads to inform the type of traffic calming implementation. It is also useful to gain some understanding of who is engaging in hoon behaviours with car enthusiast groups a good source for understanding what is occurring in the local area. Car enthusiasts were recognised by jurisdictions as distinct from hoon drivers and can often be identified by the expense and care taken with their vehicle.

Limitations

The findings are limited in their generalisability. Research concerning hoon behaviours is limited, and a small number of studies were identified, particularly in relation to evaluations of legislation and other interventions in Australia. Furthermore, consultations were conducted with four locations and the approaches to address hoon behaviours highlighted that the *specific* road environment, local community, hoon drivers and their behaviours are critical to understand prior to making decisions to introduce legislation or other interventions. Therefore, definitive conclusions cannot be drawn from the findings in this study regarding state-wide actions, rather tailored interventions to specific locations appear to be needed. For example, it is recommended that during the planning stages of new estates, consideration be given to road engineering that is encouraging of hoon behaviours.

Conclusions

The current report provides consolidated information from Australian and international literature that has examined hoon behaviours. Legislation, interventions, and associated factors with hoon drivers were included in the study findings. This information has been incorporated with the insights from four Australian jurisdictions to provide the following recommendations for consideration when implementing hoon behaviour interventions.

- Coordinated efforts and collaboration between councils, police, and transport departments are important to the success of hoon behaviour initiatives.
- Consider the cost-effectiveness and sustainability of solutions. Police resources are expensive as are some road engineering initiatives such as skid-resistant road treatments.
- Interventions in one location may relocate hoon behaviours to another area rather than deter or prevent the behaviours.

- Increase the perceived certainty of apprehension from enforcement initiatives.
- Community engagement is critical prior to implementing interventions including clear messaging around new interventions.
- Engagement with car enthusiasts could provide needed information that will better inform interventions.

It is recommended that further insights be gained on hoon behaviours specific to particular problem areas in Victoria, as well as specific approaches to address these.

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1. INTRODUCTION

This report is submitted by the Centre for Accident Research and Road Safety – Queensland (CARRS-Q). The project team is led by Natalie Watson-Brown, with co-investigators Oscar Oviedo-Trespalacios, Isaac Salisbury and expert advisor Barry Watson. A final review of the report has been undertaken by subject matter expert Teresa Senserrick. The proposed project team comprises multidisciplinary expertise spanning psychology, road safety, and human factors which are pertinent to this proposal. The outcomes from the study may be used to assist the Victorian Department of Transport to support the recommendation of interventions to reduce hoon behaviours which have increased since the COVID restrictions in 2020, and ultimately improve the perceived safety of Victorian communities.

1.1 Background

The Victorian Department of Transport (DoT) has commissioned the Queensland University of Technology, CARRS-Q to deliver the project, *Identifying any new approaches to addressing the hoon behaviour of drivers in local communities and any newly identified motivations behind the behaviour* (CP001). The DoT provided the following introductory background to this project:

The 'Victorian Road Safety Strategy 2021-2030' aims to halve road deaths and reduce serious injuries by the end of this decade. During the life of the Strategy, new initiatives will be rolled out to reduce the prevalence of high-risk driving behaviour on our roads including hooning, speeding, drink and drug driving, fatigue, and distracted driving (illegal mobile phone use). The implementation of new enforcement technology will also assist in making these initiatives effective.

Anti-hoon laws were introduced in Victoria in July 2006 and further enhanced in 2011 with the aim of making our roads safer and reducing road trauma. Hooning offences carry penalties of impoundment, immobilisation, or forfeiture orders of a vehicle.

COVID restrictions saw an increase in hooning activity, likely due to reduced passive surveillance of vehicles later at night, reduced enforcement capacity from Victoria Police, and social unrest for particular cohorts; community groups frequently raise this as an issue. At recent consultations with councils, 17 local government authorities (LGAs), unprompted, raised hooning as one of their top 3 road safety concerns. The Victorian Government has established a Hooning Community Reference Group to develop community-led action plans to deal with hoon driving across Victoria, in particular in the North, West and South-East of Melbourne.

The successful Provider shall undertake a series of tasks to build a greater understanding of Hooning and identify what has changed over the years as well as what has worked and what hasn't worked.

1.2 Aims

The aims of this project are to:

1. *Undertake a literature search relating to hooning interventions and legislative treatments in all Australian jurisdictions, particularly NSW, QLD and SA, and international jurisdictions with a similar road safety record to Victoria.*

- 2. Undertake telephone interviews with Brimbank City Council and Logan Council and one other jurisdiction to gain an understanding of the impact of interventions they have implemented, the key stakeholders involved, what worked and what didn't work and what they would do differently and the community sentiment.*

1.3 Report Structure

The following chapter includes the literature review methods followed by a chapter on the literature review results addressing the first component of the project. Chapter Four addresses the second component, the consultations, including the context for conducting these consultations. The final chapter documents the overall conclusions highlighting the effectiveness of interventions.

2. METHODS

2.1 Literature review

An initial scoping review of the literature was undertaken to guide the development of key search terms. The following terms were included as specified by DoT:

- Hooning
- Loss of traction
- Excessive noise
- Street racing
- On road gatherings.

In addition, the following additional search terms were included based on the preliminary findings of the scoping review:

- Drag racing, speed racing
- Drifting, burnout, donut, wheelspin
- Convocation, rolling road block
- High-range/excessive/extreme speed
- High-range/excessive/extreme drink driving
- Boy racer, rev-head, lout, stunt driving, ghost riding
- Delinquent driver, Mat Rempit, hashiriya.

This initial review identified some key literature to include in the final reporting of literature, as well as highlighting the lack of information in peer-reviewed literature regarding jurisdictions in Australia that had implemented hooning interventions. This suggests there may be a lack of rigorous evaluation of the different interventions implemented across Australia.

A scan of a news database, Factiva, was conducted to identify Australian jurisdictions, including and in addition to Brimbank City Council and Logan City Council (highlighted by DoT) that have implemented interventions to target hoon behaviours in their community. Summaries of these jurisdictions were forwarded to DoT to determine the most ideal location to include as an addition to Brimbank and Logan City Councils in the consultations that form component two of the project. The decision was made to conduct additional interviews with Adelaide (Playford) and Randwick City Councils.

A scan of international and Australian transport and road safety literature (including grey literature) was conducted to identify the types of hooning interventions (including but not limited to behaviour programs and communication) and legislative treatments in all Australian jurisdictions, particularly NSW, QLD and SA, and international jurisdictions with a similar road safety record to Victoria. To provide context to the interventions, consistency of hooning definitions was examined across jurisdictions. Furthermore, the literature was scanned for associated factors and motivations for hoon behaviours, including but not limited to human factors, the transport system, and technology.

Searches were systematically conducted of the following databases during July 2022:

- PsycINFO
- SafetyLit
- Scopus
- Transport Research Information Documentation (TRID, which includes the USA Transportation Research Information Service [TRIS] and the International Transport Research Documentation [ITRD]).

Targeted websites including police, government, and other law websites (noted in the reference list) were used to source legislative treatments in Australia and internationally, if this information was not identified in the systematic search. It was the intention of the initial search plan to use additional grey literature databases to ensure the full breadth of Australian jurisdictions having implemented hooning interventions has been identified. However, the above search outcomes provided a wealth of (peer-reviewed and grey) literature and did not necessarily identify specific Australian jurisdictions. Therefore, the news database Factiva was used for this purpose.

An ancestry approach was also used to obtain any other relevant key documents cited within the initially identified outputs not captured by these approaches.

Key search terms used in various combinations to search publication databases were:

- Hoon*
- “street rac*” OR “drag rac*” OR “speed rac*”
- (drift* OR burnout OR donut OR doughnut OR wheelspin) AND (car OR vehicle OR road)
- (“loss of traction” OR “excessive noise”) AND (car OR vehicle OR road)
- (convocation OR “rolling road block”) AND (car OR vehicle OR road)
- (“high-range speed” OR “excessive speed” OR “extreme speed”) AND (car OR vehicle OR road)
- (“high-range” OR “excessive” OR “extreme”) AND (“drink driv” OR DUI OR DWI OR BAC)
- (“boy racer” OR rev-head OR lout* OR “stunt driving” OR “ghost riding”) AND (car OR vehicle OR road)
- “On road gathering”
- “delinquent driver” OR “mat rempit” OR “hashiriya”

‘Hoon’ is Australian specific vernacular, therefore, in the systematic search of the international literature terms “street racing”, “speed racing”, and “drag racing” were used (general terms applicable to most jurisdictions) with “boy racers” and “stunt driving” relevant to New Zealand and the UK and Canada, respectively, and “Mat rempit” a Malaysian term and “hashiriya” Japanese.

The search focused on more recent literature, however, if deemed important and where there was a lack of updated findings concerning hoon behaviour interventions, older literature was included.

An average measure of Hofstede’s Cultural Dimension Theory measures was employed to determine appropriate selection of international jurisdictions included in the review, particularly concerning the reporting on international legislation treatments (and subsequent interpretation of the implications of findings; Hofstede et al., 2010).

Searched databases have resulted in the number of outputs as stated in Table 1.

Table 1. Summary of Database Records Screened

DATABASE	RESULTS
PSYCINFO	356
SAFETYLIT	218
SCOPUS	1,186
TRID	196
TOTAL	1,956
WITH DUPLICATES REMOVED	1,833

The selection of relevant studies was based on the output that included content with the same meaning that was intended by the search, that is, ‘hoon’ as a driving behaviour and not, for example, as an author’s name/surname. Inclusion criteria considered papers that described, reviewed, or evaluated hooning interventions or factors associated with identified hoon behaviours. It was therefore relevant to include ethnographic research on the youth car enthusiast culture.

Reference lists in papers were scanned for additional relevant papers that had not been found in the search results. Five additional papers were found using this method.

Quality rating of studies included in the final summaries were conducted using the Imberger et al. (2010) rating scale specified in the request for quotation by DoT. Table 2 provides an overview of this rating scale.

Table 2. Imberger et al. (2010) Quality of Research Rating Scale

Study type	Descriptive statistics only	Simple statistical analysis	Complex statistical analysis
Simple study – no controls, low sample size (e.g. less than 50).	1	1	(not likely)
Study without control group but some control over level of impairment of the medical condition being assessed, and/or higher sample size (e.g. 100 or more), and/or linked to performance on driving test/crash outcomes.	2	2	(not likely)
Study using comparison group to control for other factors with suitable sample size (e.g. 100 or more).	3	4	5
Study using comparison group to control for other factors, generally using controls based on similar characteristics to the treatment group e.g. age, ethnicity etc. with suitable sample size (e.g. 100 or more).	3	4	5
Study using comparison group to control for other factors, generally using controls based on similar characteristics to the treatment group e.g. age, ethnicity etc. with suitable sample size (e.g. 100 or more). The study will also be able to distinguish between different levels of impairment of the medical condition being assessed and/or is linked to performance on driving test/crash outcomes or systematic review (combining the results of a number of robust studies – rated 3 or more).	3	5	5

3. LITERATURE REVIEW RESULTS

3.1 The definition of 'hoon' behaviours

Hooning is typically defined in Australia as antisocial behaviour that includes street racing and speed trials, burn outs, donuts, drifting and other skids, and unnecessary speed or acceleration, as reflected in the search terms used in this review (Leal et al., 2007). Terminology referred to in the literature included as output from the search has been included in Appendix 1 (Table A1). In the literature reviewed, the following vernacular was used in studies examining hoon behaviours: risky (high risk), unsafe, hazardous, careless, dangerous, and antisocial driving behaviours (Alexander et al., 2010; Folkman, 2005; Palk et al., 2007; Police Powers and Responsibilities Act and Another Act Amendment Act 2002; Voogt et al., 2014). An important distinction has been made that hoon behaviours are those that are both risky and illegal (Gee Kee et al., 2007; Leal, 2010).

Beyond the speed-based behaviours, hoon behaviours also include vehicle-based, or misuse of a vehicle intended to cause a nuisance (Clark et al., 2011; Newitt, 2012; Thake et al., 2011). These behaviours include burnouts and other uses of the vehicle that cause excessive noise and/or smoke, loss of traction and drifting, and driving styles that cause damage to the road surface or a public place.

Furthermore, in some jurisdictions, legislation has been extended to include spectators or those who endorse hoon behaviours. Therefore, an individual who promotes, photographs, or videotapes these behaviours is considered encouraging of hoon behaviours and in some jurisdictions is considered in legislation alongside those who engage in hoon behaviours.

Driving against orders or regulations has also been considered hoon behaviour. This includes driving while disqualified, suspended or unlicensed, driving an unregistered vehicle, driving a modified vehicle that is not compliant with safety standards, and breaching alcolock.

Other high-risk behaviours have also been classified as hoon behaviours and include drink driving with blood alcohol concentration of at least 0.10g/dL, evading police officers, driving without proper control of the vehicle, and trespassing with a vehicle.

There are nuanced differences in defining hoon behaviours in legislation across Australian states and internationally which has made international comparisons of prevalence difficult (Vingilis & Smart, 2009). This is discussed in the next section.

3.2 Legislative treatments

3.2.1 Australia

Legislation differs amongst Australian states. Table 3 highlights what is considered hoon behaviour in each states' legislation, and how each of the relevant behaviours to each state is deemed punishable. That is, all Australian states have used impoundment of vehicles since the 1990s as a consequence of being caught for engaging in hoon behaviours, however, the level of seriousness differs by state with some behaviour leading to vehicle impoundment at the first offence and others at the second offence. The length of time a vehicle is impounded also differs between states and is dependent on the behaviour type. Each state has a prescribed length of time between offences that determines the classification of second or additional offences.

Table 3. Hoon Behaviour Legislation by Australian State

	VICTORIA	NSW	QUEENSLAND	SOUTH AUSTRALIA	WESTERN AUSTRALIA	NORTHERN TERRITORY	ACT	TASMANIA
LEGISLATION	Road Safety Act 1986 Crimes Act 1958 Road Safety Rules 2009	Road Transport Act 2013 Crimes Act 1900 Road Rules 2014	Police Powers and Responsibilities Act 2000	Criminal Law Act 2007 Amendment Act 2009 Variation Regulations 2010	Road Traffic Act	Transport Legislation Amendment Bill 2009 Traffic Act Traffic Regulations	Road Transport Act 1999	Police Offences Act 1935 Traffic Act 1925
VEHICLE IMPOUNDMENT LENGTH OF TIME								
1 st offence	30 days	3 months	90 days	28 days	28 days	48 hours	3 months	28 days (or 7 days if trespassing with a vehicle)
2 nd offence	45 days – 3 months	Forfeit	Forfeit 7 days for Type 2	6 months (in last 10 years) Forfeit (in last year)	3 months	3-6 months	Forfeit	3 months+
3 rd and additional offences	Forfeit	Forfeit	Forfeit 90 days for Type 2	Forfeit	Forfeit	Forfeit	Forfeit	Forfeit
Prescribed period for repeat offences	6 years	5 years	5 years	10 years	5 years	2 years	No time limit	-
OFFENCE								
Participating in races/speed trials	1	x	1		x	x	x	x
Organising races/speed trials	1	x	1				x	
Continuing to operate a vehicle that has lost traction (burnouts)		x			x	x	x	x (“exhibition of speed or loss of traction”)
Knowingly driving on slippery road to lose traction		x						
Damaging the road surface or public place						x		
Deliberate excessive noise/smoke (e.g., burnouts)	1		1	x	x			x (just noise)
Promoting, photographing or videotaping drag racing or burnouts to encourage them	Local government area by-laws (Brimbank, Frankston)	x						

	VICTORIA	NSW	QUEENSLAND	SOUTH AUSTRALIA	WESTERN AUSTRALIA	NORTHERN TERRITORY	ACT	TASMANIA
Participating in any group activity involving drag racing or burnouts		x						
Driving a modified vehicle not compliant with safety standards			2					
Driving disqualified, suspended or unlicensed	1		2		x			2
Driving an unregistered/ uninsured vehicle			2					
Driving without proper control	1			x				
Evading/disobeying police	1	x	1					x
Driving negligently or dangerously when chased by police	1	x						
Drink driving	1 (BAC > 0.10) 2 (BAC < 0.10)		2 (BAC > 0.15)					
Breaching alcolock	1							
Excessive speeding	1 (>45 km/h over limit / >145km/h)	x (>45 km/h)	2 (>40km/h)	x	x (>45 km/h)			x (>45 km/h)
“Dangerous driving”			1	x	x			x
“Careless driving”			1	x	x (reckless)			x (reckless)
“Menacing driving”							x	
Riding mini-motorbike on road	1							
Deliberate train track crossing with oncoming train	1							
More passengers than seatbelts	1							
Endangering emergency / custody workers	1							
Driving into and damaging emergency services vehicle	1							
Trespassing with a vehicle								x

Note. 1 = vehicle impounded at first offence. 2 = vehicle impounded at second offence. X = impoundment status unknown; behaviour is illegal. [blank] = behaviour not considered illegal in that state. (Government of South Australia; Northern Territory Government, 2015; NSW Government, 2021; Queensland Government, 2021; Crosswell; Tasmania Police, 2016; Victoria Legal Aid, 2022; Western Australia Police Force, 2022).

Brimbank City Council passed by-laws that include punishment for participation in, encouragement of, or attendance at a hoon event, highlighting that vehicles cannot stop or park in the vicinity of the event without a lawful excuse.

There are limited evaluations concerning the effectiveness of vehicle impoundment as punishment for hoon driving behaviours. In Queensland, between 2002 and 2008, over 5,000 vehicles were impounded. Research found that drivers who had engaged in hooning perceived impoundment and forfeiture to be severe punishment and reported a reduction in the intention to hoon (Armstrong & Steinhardt, 2006; Leal et al., 2010). This finding is reinforced by the low occurrences of re-offending with 2% committing a second hoon offence and less than 1% a third offence according to police impoundment data (Leal et al., 2007). Moreover, in focus groups consisting of hoon drivers, some participants commented that they would avoid police rather than forfeit their vehicle (Leal et al., 2009). It is important to note that first offences remained at a stable number over time (Leal et al., 2010), however, there was a reduction in the overall number of hoon behaviour offences, with an additional positive impact on other traffic offences.

In South Australia, impoundment was one element of Task Force Diagonal implemented in 2010 where targeted hooning clubs ceased operations in response (Newitt, 2012; discussed further in section 3.3.1.1)

A study conducted in Victoria found more than 70% of hoon drivers who had experienced impoundment (and responded to the survey) reported no further engagement in hoon behaviours (Clark et al., 2011). Although, when asked about hoon behaviour in the last month only 13% reported no engagement. Additionally, 77% of those who were caught were aware of the impoundment legislation. These hoon drivers perceived the punishment to be unfair with the greatest inconvenience the associated costs and fines received followed by losing access to their vehicle (Clark et al., 2011). A survey of the general population in Victoria found impounding a vehicle for up to 30 days was perceived as not tough enough, but that forfeiture for a third offence was adequate (Alexander et al., 2010). Younger people tend to have a more negative view of impoundment compared to older individuals (Alexander et al., 2010). Before Victoria's Anti-Hoon Legislation in 2006, Victorian police conducted special operations to prosecute hoon drivers, for example, Operation Stoker in 2004 which resulted in 474 charges under the existing legislation at that time. However, these operations seemed to have limited long-lasting effects on hoon behaviours. Between 2006-2008, immediately after the introduction of Victoria's Anti-Hoon Legislation, over 5,000 hoon offences were recorded with only a 3% reoffending rate (Perry & McGillian, 2008).

The NSW Traffic Amendment (Street and Illegal Drag Racing) Act 1996 was reported to have successfully ceased congregations of car enthusiasts who engage in illegal hoon behaviours soon after its enactment (New South Wales Parliament. Joint Standing Committee on Road Safety, 1997). This amendment provided police with the power to confiscate hoon drivers' vehicles. Additionally, unlike other states, the Amendment included the promotion and video recording of hoon behaviours that encourages hooning as illegal behaviour. No further reporting since that time was identified in the literature.

Graduated licensing systems have also been considered potentially effective in reducing hoon driving behaviours, because hoon behaviours have been considered an element of the broader young driver problem. Specifically, night driving and peer-passenger restrictions have been effective in reducing the crash risk of young drivers, because hoon behaviours and crashes with young drivers were more likely to occur at night and with similar-age passengers (Armstrong & Steinhardt, 2006; Leal et al., 2007).

3.2.2 International

Legislation in international jurisdictions is summarised in Table 4 and includes countries identified as having a similar road safety record to Victoria and culturally similar to Australia according to Hofstede's Cultural Dimensions Theory measures (Hofstede et al., 2010). The Hofstede Culture Compass[™] tool compares countries based on six cultural dimensions according to Cultural Dimension Theory: power distance, individualism, masculinity,

uncertainty avoidance, long term orientation, and indulgence (Hofstede et al., 2010). For each country, each dimension is scored from 0 to 100, for example Australia's scores are 38 power distance, 90 individualism, 61 masculinity, 51 uncertainty avoidance, 21 long term orientation, and 71 indulgence. The rightmost column in Table 4 presents the average absolute difference between the cultural dimensions of that country and Australia.

Table 4. Hoon Behaviour Legislation by International Jurisdictions

INTERNATIONAL JURISDICTION	LEGISLATIVE TREATMENT	EVALUATION AND SUCCESS OR NOT	HOFSTEDE CULTURAL COMPARISON WITH AUSTRALIA*
NEW ZEALAND	<p>Boy Race Act – 2003 Vehicle impoundment for revoked, disqualified or suspended licence; impoundment up to 28 days. Race-related offences are punishable by immediate disqualification of licence.</p> <p>The New Zealand Vehicle Confiscation and Seizure Bill introduced 26 March 2009 (enforced 1 December 2009) and the Land Transport (Enforcement Powers Act) give law enforcement more powers to confiscate and/or destroy (crush) vehicles used by recidivist street racing offenders. The 2009 bill allowed the confiscation of vehicles that were involved in a street racing incident but were owned by a third party (not the offending driver). Another change was that mandatory confiscation on third offences was removed and replaced with judge discretion.</p> <p>Current legislation: -1st offence: 28 days impoundment -2nd offence: 28 days impoundment -3rd offence: impoundment or confiscation/destruction of vehicle upon discretionary order from judge. (Repeat offences counted within 4 years)</p> <p>Other penalties can include imprisonment up to 3 months, fine up to \$4,500, and licence disqualified for 6 months.</p> <p>From YouthLaw (2022), street racing offences include</p> <ul style="list-style-type: none"> • Race on a public road, or drive with unnecessarily high speed or acceleration; • Spill oil or petrol on the road to make a vehicle lose traction; • Intentionally cause a vehicle to lose traction (do a wheel spin) without reasonable excuse; • Use a traction engine in public, unless you have a current qualification to use one. 	<p>Decline in disqualified and unlicensed driving</p> <p>The first car to be crushed as a result of legislation to prevent street racing was on 21 June 2012. At that time, New Zealand Police reported a 29% reduction in boy racing since 2009 (New Zealand Parliament, 2012).</p> <p>Mean number of deaths and injuries per year attributed to street racing decreased from 6.625 deaths and 82.25 injuries in 2001-2008 to 2.2 deaths and 28.4 in 2010-2014. (Jones, 2016)</p>	8
UNITED KINGDOM England	<p>Anti-social Behaviour Act 2003 and Road Traffic Act 1988 If found guilty of street racing, penalty in loss of licence for 12+ months and maximum fine of \$3,300.</p>		9.5

INTERNATIONAL JURISDICTION	LEGISLATIVE TREATMENT	EVALUATION AND SUCCESS OR NOT	HOFSTEDE CULTURAL COMPARISON WITH AUSTRALIA*
Scotland	<p>Anti-social behaviour (Scotland) act 2004, enacted in 2005</p> <ul style="list-style-type: none"> - dispersal orders (Section 3) - seizure of vehicles <p>Vehicles can be seized on repeat offence after first warning from police.</p> <p>After a vehicle is seized, there is a cost of 105 pounds + 12 pounds per 24 hours that the vehicle is held. If the vehicle is not collected within 3 months, the vehicle is crushed.</p>	<p>Dispersal orders caused conflict between police and car enthusiasts due to what was once delinquent became illegal</p> <p>Police officers believed that the anti-social behaviour legislation effectively dealt with deviant driving (Lumsden, 2015)</p>	6.8
CANADA			
Manitoba	<p>Vehicle impoundment for suspended licence; impoundment up to 30 days</p>	<p>Specific deterrent effect – decline in driving while suspended offences over a six-year period (Beirness et al., 1997)</p>	
Ontario	<p>Street Racers, Stunt and Aggressive Drivers Legislation – 2007</p> <p>Relevant to the following behaviours:</p> <ul style="list-style-type: none"> - drifting - burnouts/donuts - wheelies - ghost riding - preventing another vehicle from passing - playing chicken (2 cars drive side-by-side with one car in the oncoming traffic lane - driving as close as possible to another vehicle, pedestrian or object without reason - driving 50 km/hr or more over the limit <p>Immediate suspension of licence and seven-day impoundment prior to conviction</p> <p>\$2,000-\$10,000 fine for conviction</p> <p>Second conviction within 10 years, licence suspension up to 10 years</p>	<p>From Gargoum & El-Basyouny (2018)</p> <ul style="list-style-type: none"> -Legislative changes for extreme speeding were associated with drops in fatal crashes. -In Ontario, legislative changes resulted in a post-intervention decrease by 11 fatal collisions (18.3% drop) compared with pre-intervention period. Reduction of around 97 injury crashes was not significant in Ontario. -In British Columbia, excessive speeding policy was associated with an statistically significant 22% drop in fatal collisions. However, the mean number of crashes increased, but the Impaired Driving Law which was implemented at the same time as British Columbia’s Excessive Speeding law was associated with a drop in injury collisions. However, when the Impaired Driving Law was decreased in November 2011, there was a slight increase in injury collisions. - In Quebec, Extreme Speeding Law was at the same time as new Distracted Driving Law. After both laws were enacted, there was a non-significant trending decrease in fatal crashes of 5.5%. Injury crashes were significantly decreased after the new laws, with a decrease of 325 crashes compared to pre-exposure. <p>From (Meirambayeva, Vingilis, Zou, et al., 2014)</p> <ul style="list-style-type: none"> -A significant intervention effect on reduced extreme speeding convictions after the 2007 Ontario laws was found for males, but not females. -Because males are more likely to engage in street racing and stunt driving, this is interpreted to mean that the new legislation was successful intervention for street racing and stunt driving. <p>From (Meirambayeva, Vingilis, Mcleod, et al., 2014)</p> <ul style="list-style-type: none"> -Introduction of the 2007 Ontario street racing and stunt driving laws were associated with a reduction of 58 fewer casualties per month, on average, among young male drivers (16-25 years old). 	

INTERNATIONAL JURISDICTION	LEGISLATIVE TREATMENT	EVALUATION AND SUCCESS OR NOT	HOFSTEDE CULTURAL COMPARISON WITH AUSTRALIA*
UNITED STATES	<p>Ohio</p> <p>Vehicle impoundment for suspended licence; impoundment up to 30 days or 60 days for a repeat offence In Ohio, street racing or drag racing is a first-degree misdemeanour that can also result in up to 180 days jail, \$1000 fines, and suspension of licence for between 30 days and 3 years. On subsequent street racing offences, it is classified as a felony of the fourth degree. Relevant legislation is Section 4511.251 of the Ohio Revised Code.</p>	<p>Lower recidivism for those whose vehicle was impounded over a two-year period (Voas et al., 1998)</p>	3
California	<p>Vehicle impoundment for suspended licence; impoundment up to 30 days</p> <p>The city of San Diego in California also introduced a spectator ordinance which came into effect 21 October 2002 (San Diego Municipal Code, Chapter 5, Article 2, Division 52) “Any individual who is knowingly present as a spectator, either on a public street or highway, or on private property open to the general public without the consent of the owner, operator, or agent thereof, at an illegal motor vehicle speed contest or exhibition of speed is guilty of a misdemeanor subject to a maximum of six months in jail and a fine of \$1,000” (San Diego Municipal Code, 0-19118 N.S.). From Worrall and Tibbetts (2006)</p> <p>San Diego then introduced a forfeiture ordinance on 4 April 2003. “a motor vehicle shall be declared a nuisance and forfeited subject to this division if ... [i]t is used in violation of California Vehicle Code sections 23109(a) or (c); and ... it is being driven by the registered owner of the vehicle, the registered owner is a passenger, the registered owner’s immediate family members is driving or riding in the car, or the driver or passenger lives at the same address as the registered owner.” Also, must have had at least one previous conviction, so forfeiture is only for 2nd+ offence. From Worrall and Tibbetts (2006)</p>	<p>In the year following impoundment, more than 20% had fewer driving while suspended offences for first-time offenders and more than 30% decrease on repeat offenders (DeYoung, 1999, 2000)</p> <p>Decline in street racing related fatalities in San Diego (Worrall & Tibbetts, 2006)</p> <p>According to RaceLegal in San Diego, in 2003 there was a 99% reduction in organised illegal street racing and 79% improvement in illegal street racing crash mortality.</p> <p>Zero-inflated binomial regression models of crashes attributed to illegal street racing in San Diego suggested that the forfeiture ordinance had by far the biggest impact, followed by sanctioned races, media coverage, then the spectator ordinance. (Worrall & Tibbetts, 2006)</p>	

*The mean absolute scale difference between the country in question and Australia. The lower the score, the more similar the country is to Australia.

Findings in relation to the effect of vehicle impoundment on hoon behaviour offences are limited to studies conducted in New Zealand, the UK, Canada, and the United States. Driving once a licence has been suspended has been identified as an offence where recidivism seems to decrease with vehicle impoundment, but only when enforced (DeYoung, 1999, 2000; Voas et al., 1998). When compared with laws making it illegal to spectate illegal street races in San Diego, impoundment and forfeiture laws seemed to have a larger effect on reducing racing-related crashes (Worrall & Tibbetts, 2006). However, there is generally less evidence for the effectiveness of vehicle forfeiture on hoon behaviours, including licence suspension, most likely due to forfeiture being less likely to be enacted by enforcement officers (Peck & Voas, 2002). Furthermore, some drivers voluntarily forfeit their vehicle after impoundment due to the costs of reclaiming it (Peck & Voas, 2002). Therefore, forfeiture and impoundment are not completely independent and therefore difficult to evaluate separately.

A study in the US found hoon drivers were only fearful of damaging their vehicles, rather than risk of injury or apprehension by law enforcement. Hoon drivers are careful to avoid police by racing on certain roads and only with people that they know (Hughes, 2018).

In Ontario, Canadian legislative changes that made driving with excessive speeds (>40 km/h over limit) punishable with licence suspension and vehicle impoundment resulted in a decrease of 18% in total fatal crashes (Gargoum & El-Basyouny, 2018). In British Columbia, excessive speeding policy was associated with a 22% decrease in fatal collisions. The Impaired Driving Law which was implemented at the same time as British Columbia's Excessive Speeding law was associated with a drop in injury collisions. However, when the Impaired Driving Law was discontinued in November 2011 (13 months after it was introduced) due to being deemed unconstitutional by a Supreme Court judge, there was a slight increase in injury collisions considered by the authors to be at least partly attributable to reversal of the Act (Gargoum & El-Basyouny, 2018).

In Quebec, the Extreme Speeding Law was implemented at the same time as a new Distracted Driving Law. After both laws were enacted, there was a non-significant trending decrease in fatal crashes of 5.5%. Injury crashes decreased after the new laws, with an average decrease of 325 crashes per month across the 70 months post-intervention compared to the average from 52 months pre-exposure (Gargoum & El-Basyouny, 2018).

3.3 Hooning interventions

3.3.1 Summary of Australian literature

Fourteen studies (see Table A2 in Appendix 2) were identified that discussed some form of intervention to address unsafe driver behaviour in Australia. Interventions could be grouped into enforcement, education and engagement, and engineering and vehicle modifications.

3.3.1.1 Enforcement – Sanctions and policing

Research has shown that deterrence-based interventions appear to have limited effectiveness on self-reported intentions with hoon drivers and more targeted initiatives are required to prevent these behaviours (Leal et al., 2009; Voogt et al., 2014). That is, although impoundment and forfeiture is perceived as harsh, young hoon drivers have reported that they do not intend to change their behaviours based on these measures alone (Voogt et al., 2014). In Queensland, when vehicle impoundment was first introduced, the 48-hour impoundment was considered reasonable by some hoon drivers, but others believed it was harsh and would respond to the threat of forfeiture by running from police (Leal et al., 2009). Research has shown that there is a positive relationship between drivers' intention to hoon and how severe they perceive a punishment to be, with participants more likely to hoon rating punishments as more severe (Gee Kee, Steinhardt et al., 2007). Suggested reasons for this relationship is that hoon drivers do not believe they will be caught by police either due to their knowledge of police whereabouts or the

ability to flee (Gee Kee, Steinhardt et al., 2007; Voogt, Day & Baksheev, 2014). Another possible explanation is that hoon drivers may be more aware of and more critical of hoon laws because they are most likely to be affected by them. A Victorian survey study of hoon drivers found, if hoon drivers were to be caught by police, around 70% believe this would be via patrol with others suggesting by speed cameras and by witnesses, with hoon hotline considered the least effective method of identifying hoon drivers (Clark et al., 2011).

There is evidence for specific deterrence effectiveness from enforcement operations across Australia as discussed below.

South Australian Police (SAPOL) instigated 'Task Force Diagonal' to enforce hooning laws and address three popular hooning clubs in Adelaide in 2010. They did this by first engaging with the clubs and promoting safe and legal cruises and club behaviour, but that was disregarded, and clubs continued hooning with deliberate attempts to hide their activities from police by moving their meets to areas that were monitored less and by congregating at times that when police shifts transitioned. SAPOL then created a taskforce which resulted in 206 arrests/reports, 614 vehicles 'defected', 102 vehicles impounded, and two vehicles forfeited. The targeted hooning clubs then ceased operations (Newitt, 2012).

Victorian Police currently has an anti-hoon taskforce called Operation Achilles which involves increased police presence at known hoon hot spots. Between July 2021 and June 2022, 240 hoons have been charged and 150 cars seized under Operation Achilles (Beatty, 2022).

In Queensland, when the anti-hoon legislation was introduced in 2002, a Traffic Response Group (TRG) was established consisting of six police officers (<0.1% of the Queensland Police force). Using covert technology to assist in the detection of hoon drivers, this small group was responsible for approximately 15% of vehicle impoundments (Folkman, 2005). TRG believed that enforcement was key and if a police presence is not maintained then the level of hoon behaviour would revert to that prior increased enforcement. TRG was successful in ceasing the rolling blockades on the M1 motorway, where drivers involved with organising illegal street races would slowly drive side-by-side across all lanes of the motorway to block traffic from a race (Folkman, 2005). Offenders were recorded at the time of the offence without intervention. Interviews and prosecution occurred at a later date.

In Wollongong NSW, enforcement focused on hoon behaviours has been criticised for inhibiting a legitimate form of creative and cultural expression in the custom-car culture, with the Revfest in 2008 cancelled last minute by the local council (Warren & Gibson, 2011). There is a delicate balance between enforcing hoon laws and not targeting car enthusiasts, who have been considered a significant and valuable part of the community (Warren & Gibson, 2011).

3.3.1.2 Education and engagement

Education and engagement refers to community in general and more targeted education of hoon driving groups and individual hoon drivers. However, there is limited evaluation and therefore little evidence of the effectiveness of education and engagement for reducing hoon behaviours.

As mentioned above, Task Force Diagonal in South Australia made a first attempt to engage with hoon clubs to encourage legal cruising but when this engagement and education failed, SAPOL reverted to targeted enforcement (Newitt, 2012).

Safe places to engage in hoon behaviours has been a controversial initiative, with limited support to suggest this results in a reduction in illegal hoon behaviours. In a Victorian survey of hoon drivers, around 20% of participants believed access to a safe place would deter illegal hoon behaviours (Clark et al., 2011). Focus groups in Queensland

with young drivers involved with car communities also suggested that access to more safe and legal track races would decrease illegal street racers, but the participants expressed that participating in track racing is expensive due to the cost of both accessing the circuit and acquiring the required safety equipment (like fire-proof suits) (Armstrong & Steinhardt, 2006). Participation in legal track races could be encouraged with subsidies and by refraining from setting up 'defect stations' on the way out of legal events, which make participants feel like they are being unduly scrutinized (Armstrong & Steinhardt, 2006).

Operation Drag Right And Gain – a longer life (D.R.A.G.) was implemented on the Gold Coast in the early 1990s by Queensland police officers that were members of the Blue Light Association. Queensland Monaro and Torana clubs held race meets at the Surfers Paradise Raceway. As part of this initiative youth were involved in building vehicle engines. Similarly, Operation D.R.A.G. was implemented in Warwick Queensland in 2005-2006. This program funded youths at risk of dangerous driving to complete a TAFE mechanics course and build cars to race on the legal raceway in order to reduce boredom and encourage alternative life goals (Folkman, 2005). However, no evaluations of these programs were published.

The Safe Driving Program was introduced in Victoria in 2013 where convicted hoon drivers were required to complete this program which involved raising awareness of risks, motivations, and triggers for hoon driving (VicRoads, 2020). However, no evaluations of the effectiveness of this program have been published at time of writing.

Operation Young Drivers at Risk (YARD) is a Queensland program delivered in high schools anticipated to provide knowledge concerning vehicle control and the risks, the physics of driving, peer pressure and consequences (Folkman, 2005). The program involved one-hour sessions with each high school, but there was also no evaluation of this program published.

Hoon hotlines are employed across all states to encourage communities to report hoon behaviours, with debatable effectiveness in deterring hoon behaviours. In Queensland the Traffic Returns Analysis and Complaints System (TRACS) was extended to include complaints concerning hoon behaviours. This was trialled in 1999-2000 and implemented statewide following the success (Folkman, 2005). In Victoria the Crime Stoppers Hotline has been valuable. In Frankston between 2005 and 2007 over 80% of calls made to the hotline were reported by police to be important for the deterrence of hoon behaviours (Perry & McGillian, 2008).

3.3.1.3 Engineering and vehicle modifications

Traffic calming solutions, such as permanent speed humps, have received mixed commentary regarding effectiveness with some suggesting speed humps attract hoon drivers who experience the humps as a driving challenge to be conquered (City of Logan, 2020). Others suggest that mobile speed humps are an improved design that allow for testing of the intervention without the permanency and cost in removing when residents report that hoon drivers continue to use the road, or the noise of the speed hump has not been deemed an acceptable solution by local residents (Midland Kalamunda Reporter, 2009).

Skid-resistant road treatment has been used in Brisbane and has been reported in news media to be successful in deterring hoon drivers (Sanderson, 2019). This road treatment makes it difficult for hoon drivers to lose traction and the treatment wears tyres rapidly. However, there have been no formal evaluations of the effectiveness of skid-resistant road treatments published.

Mobile speed signs have been evaluated on the speeding behaviours of general drivers in Brisbane, finding a decrease in the number of speeding offences (Burke, 2015). Mobile signs have also been trialled by North Sydney

Council to target hoon drivers (Power & Gladstone, 2021). These mobile signs included messages other than speeding and to remind drivers of the road rules. The signs have not been evaluated.

Speed limiters modify the speedometer so that the driver's speed is only displayed when travelling under the speed limit. Focus group participants acknowledged that speed limiters would deter their hoon behaviours that involved excessive speeding, however, there was an overall sense that this would be ineffective (Clark et al., 2011).

3.3.2 Summary of International literature

Twenty-two papers were identified in the international literature that examined hoon behaviour interventions (see Table A3 in Appendix 3).

3.3.2.1 Enforcement – Sanctions and policing

Legislation in Ontario, Canada introducing impoundment as a punishment for street racing and stunt driving was evaluated, finding that those who engage in street racing and stunt driving had a negative response to the changes (Meirambayeva, Vingilis, Zou, et al., 2014; Yildirim-Yenier et al., 2015). However, there was a reduction in extreme speeding and fewer road casualties reported for males aged 16-25 years after the introduction of the legislation (Meirambayeva, Vingilis, McLeod, et al., 2014). There was a greater impact on male drivers over females which has been argued as evidence that the legislation successfully targeted street racers and stunt drivers as they are predominantly male.

Legislation in New Zealand that added impoundment as a punishment for street racing and related offences in 2003 did not appear to have an impact on reducing the targeted hoon behaviours. Rather, hoon behaviours shifted from major city centres to more industrial areas according to ethnographic research in the boy racer community (Beere, 2007).

San Diego's spectator and forfeiture ordinance was successful in reducing street racing casualties, with the forfeiture having a greater impact than the spectator ordinance (Worrall & Tibbetts, 2006).

Police monitored cameras were installed in Hamilton, New Zealand. However, young people reported that the camera did not influence their driving or car enthusiast congregation (Beere, 2007). Other jurisdictions have used CCTV, increased policing, and speed checks yet there was a lack of evidence nor evaluation that these approaches are successful (Lumsden, 2016). Light and sound metres—devices that can measure the brightness of a vehicle's headlights or loudness of an engine or exhaust—are used by police to test if modified vehicles conform to vehicle safety standards, but the use of these devices has not been formally evaluated in the published literature (Lumsden, 2015).

3.3.2.2 Education and engagement

RaceLegal was an initiative implemented in San Diego, United States, that provided a safe and legal racing strip. Those who ran RaceLegal claimed that an estimated 52 deaths and 101 serious injuries (approximately \$162,088,000 in damages) were prevented between 2003-2006 as a result of this initiative (Vingilis & Smart, 2009). However, other research indicates that sanctioned races did not decrease illegal street racing casualties in San Diego when street racing legislation that was introduced around the same time was also factored in (Worrall & Tibbetts, 2006). Some authors have noted that the fact that many hoon behaviours are spontaneous decisions could compromise the effectiveness of safe tracks as an intervention (Clark et al., 2011). However, the idea that illegal street racing is a consequence of a lack of legal racing venues is popular with the general public, street racers themselves, and motoring magazines (Balkmar, 2012; Yateman, 2021).

In Aberdeen, Scotland, car enthusiast ‘organisers’ (described as gatekeepers) regularly meet with police, which is reported to have fostered self-policing within the hoon community (Lumsden, 2016). However, the legislation that aimed to reduce hoon behaviour was perceived to target car enthusiasts who found the legislation confusing with previously anti-social behaviours now illegal (Lumsden, 2014).

The GENIUS Remaja youth wellness camp for Malaysian young motorcycle street racers (mat rempit) on self-development, emotion regulation, self-empowerment, and youth-to-youth community activities was qualitatively analysed with a positive response and change in attitudes by participants (Mohamad et al., 2019). However, no formal evaluations were published so far.

3.3.2.3 Engineering

Speed display signs in Israel have been effective in reducing extreme speeds, defined as 30km/hr over the speed limit (Siev & Kliger, 2021). However, speeding laws in Israel mean that speeds that would seem excessive in other countries (like 30km/h over speed limit) are more common among the general driving population. Therefore, the effectiveness of this intervention may not generalise to hoon driving and excessive speeding behaviours in Australia.

In Scotland, similar to initiatives in Western Australia, urban space has been regenerated yet this approach has not been evaluated (Lumsden, 2016). Although there was evidence of some locations shifting from street racing to legal ‘cruising’ scenes (Lumsden, 2013).

3.4 Motivations for and factors associated with hoon behaviours

3.4.1 Summary of literature

There were 60 papers identified in the search that examined motivations for and associated factors with hoon behaviours. The factors included demographics, personal factors, and environmental (Table A4 in Appendix 4), hoon behaviours associated with COVID (Table A5 in Appendix 5 – an additional two papers), and crash related outputs (Table A6 in Appendix 6) reported separately.

3.4.1.1 Demographics

Hoon drivers in Australia and in other countries are predominantly male and young (<25 years), though the socioeconomic status of hoon drivers can vary between regions.

Research assessing gender has found that hoon drivers were more likely to be male than female, with males comprising around 75-100% of hoon driver samples (Javid & Al-Roushdi, 2019; Leal et al., 2010; Meirambayeva, Vingilis, Zou, et al., 2014; Palk et al., 2011; Vingilis et al., 2017; Voogt et al., 2014; Wickens et al., 2017). Of females in Queensland who self-reported hoon behaviours, cruising was the most common behaviour engaged in (Gee Kee, Palk, et al., 2007). Masculinities have been analysed as a key part of hoon driving culture across countries, with females who participate also adopting the hoon culture’s masculine behaviours and ideals (Balkmar, 2012; Beere, 2007; Joelsson, 2014; Lumsden, 2010; Walker et al., 2000). For example, female participants in Aberdeen’s car enthusiast scene often paint their vehicles pink as an expression of their femininity, but otherwise drive in races, modify their cars themselves, and adopt more masculine dress to differentiate themselves from the objectified ‘bikini girls’ who model at car shows and in car magazines (Lumsden, 2010). An ethnographic study in Sweden found that young males who are hoon drivers and experience a crash or near miss are more likely to lack an emotional response and reflect with humour, whereas young females reflect on the event with more seriousness. This suggests males may be more likely to continue hoon behaviours after a crash and females may be more cautious or cease the behaviours due to a crash or near miss (Joelsson, 2014).

Young age is also associated with drivers' likelihood of engaging in hoon behaviours, though there are some drivers who continue hoon driving behaviours later into adulthood (Leal et al., 2010; Smart et al., 2012; Vingilis, Seeley, Wiesenthal, Mann, et al., 2013; Wickens et al., 2017). In Australia, drivers who have had their cars impounded for hooning offences are generally in their late teens or early twenties, with 83% of offenders in Victoria being under 28 years old (Clark et al., 2011), and 80% in Queensland being under 25 years (Leal et al., 2010), with the oldest offenders being in their mid-40s. The robust finding that drivers who engage in hoon behaviours are young suggests that many drivers 'mature out' of the behaviours sometime in their twenties (Warm et al., 2004).

Hoon drivers typically seem to be working class, but there is some variation between countries. Studies in Malaysia, Brazil and Pakistan found that illegal motorcycle racers typically did not complete high school and are unemployed or in low-income/unskilled work and may race to make money or to gain a sense of technological value (Amit et al., 2016; Jeolás, 2018; Mumshad & Ashraf, 2019; Wong, 2011). In Helsinki, Finland, street racers are also typically working-class, anti-education youth who may engage in racing for camaraderie and to escape the feelings of injustice and alienation in their lives (Vaarnen, 2004; Vaarnen & Wieloch, 2002). Street racing in the US is more common among low-socioeconomic groups and non-Caucasian drivers (Kar et al., 2018), but some hoon driving trends have also made their way into middle-class culture (Surette, 2020). A survey in São Paulo, Brazil reported 10% of medical students participating in illegal street racing (Colicchio & Passos, 2010).

Growing up with car modifying and street racing culture and an interest in motor sport was also associated with street racing (Hughes, 2018; Warn et al., 2004). In Queensland, an analysis of drivers charged with hooning showed that, of the 63% with known occupations, 19% were unemployed, 8% mechanics, 7% labourers, and 6% were students (Leal et al., 2007). Though hoon drivers are typically young working-class men, there are other groups who do occasionally engage in hoon activities in Australia, such as young females, wealthy students from Asia, and middle-aged and relatively wealthy businessmen (Folkman, 2005).

3.4.1.2 Personal factors

Impulsivity and thrill seeking are well-studied factors associated with risky driving behaviours, and specific to hoon behaviours, thrill or adrenaline experiences have been identified as associated motivations (Clark et al., 2011; Hughes, 2018). However, in large-scale surveys impulsivity and thrill seeking were found to have an inconsistent association with street racing offences, between no association (Amit et al., 2016; Vingilis, Seeley, Wiesenthal, Wickens, et al., 2013) and a weak association (Constantinou et al., 2011; Warn et al., 2004). Stunt driving was found to be associated with thrill seeking and a competitive attitude toward driving in general (Vingilis, Seeley, Wiesenthal, Mann, et al., 2013).

Personality traits are associated with different types of risk behaviours, for example, different personality traits are related to speeding compared to drink driving and compared to those who engage in multiple risky behaviours. Lower scores on agreeableness personality factor were associated with loss of traction behaviour. In this study, no other personality factors were associated with hoon behaviours (Thake et al., 2011). Other studies have found that risky driving in general is associated with neuro-psychological factors such as elements of cognition responsible for responding to stress (Brown et al., 2016), and a survey in Ontario, Canada found that fair or poor self-reported mental health was associated with a four times higher rate of street racing (Smart et al., 2012).

Research has shown that hoon behaviours can be attention-seeking behaviours, particularly in regard to gaining attention via social media avenues (Seeley et al., 2019). Social media has the potential to attract large audiences and specific hoon behaviours have been popular online trends, with young males the largest portion of the audience (Vingilis et al., 2017). Hoon drivers may wear a *badge of honour* when caught in front of large crowds, though this

is denied by some hoon drivers (Armstrong & Steinhardt, 2006). Social media attention has also been linked to an increase in motorcycle racing in those international jurisdictions where two-wheeled vehicles are more common (Mumshad & Ashraf, 2019).

Media, in particular risk-glorifying media has been known to influence risk-taking behaviours and influence individuals' attitudes toward risk to be more acceptable (Fischer et al., 2011; 2012). Similarly, street racing video games have also been associated with a more positive attitude toward street racing (Vingilis, Seeley, Wiesenthal, Wickens, et al., 2013). However, the associations between street racing video games and street racing behaviours are weak and inconclusive, while social media trends have had a more explicit effect on promoting hoon driving. For example, 'ghost riding'—where a driver exits their car and dances with it while it is in motion—was popularised by a song and resulting social media trend and copycat crime wave, making its way into mainstream middle-class culture in 2006 (Surette, 2020; Vingilis et al., 2017).

Some research suggests that hoon drivers may have attribution bias and do not perceive their behaviours to be high risk. That is, they self-identify as car enthusiasts and are distinct from others who engage in antisocial driving behaviours (Clark et al., 2011; Voogt, Day & Baksheev, 2014). One study in Malaysia found illegal motorcycle racing to be of limited concern to hoon drivers who very rarely had intention to seek help for street racing behaviour, and who believed it is associated with young age and that the behaviours would cease as they age (Wong, 2012). This is in line with young driver behaviour more generally where, particularly male drivers who have a low-risk perception of their driving behaviours (Harbeck & Glendon, 2013). Stunt drivers reported running a red light, phone use while driving and drowsy driving as lower risk compared to other drivers (Vingilis, Seeley, Wiesenthal, Mann, et al., 2013). These participants also believed street racing and excessive speed would not increase crash risk (Vingilis, Seeley, Wiesenthal, Mann, et al., 2013). Acceptance of risky driving behaviour is further increased by prior exposure to risky driving (Sarkar & Andreas, 2004). A review paper found hoon drivers underestimate the risk of their behaviours and believe they are unlikely to be caught by police due to their capacity to outwit police (Voogt et al., 2014). It has been suggested that hoon drivers perceive themselves to be targeted by police officers.

Hoon drivers have been found to engage in multiple risk-taking behaviours (Kar et al., 2018; Vingilis, Seeley, Wiesenthal, Wickens, et al., 2013). A study in Saudi Arabia found hoon drivers are willing to engage in other dangerous behaviours and have a low-risk perception of phone use while driving and not wearing a seatbelt (Ramisetty-Mikler & Almakadma, 2016). In multiple countries, a link has been identified between these types of hoon crimes and more serious crimes such as car theft, fraudulent plates, violence and intimidation and involvement with drugs (Amit et al., 2016; Hall, 2021; Voogt et al., 2014; Vingilis et al., 2011; Falconer & Kingham, 2007). There is mixed evidence about the association between hooning and drink driving, with some studies finding drink driving common among street racers (Knight et al., 2004; Smart et al., 2011; Wong, 2011) while others show that hoons consider drink driving taboo or too dangerous (Armstrong & Steinhardt, 2006; Joelsson, 2014). In Malaysia, motorcycle street racers are more likely to smoke, watch pornography, are involved in physical fights, and gamble (Ibrahim et al., 2015). Hoon drivers who have a negative perception of legislation concerning hoon behaviours tend to have a greater number of traffic violations in general (Yildirim-Yenier et al., 2015).

Though individual factors like personality, mental health, social media engagement, risk perception, and criminality have all been implicated in hoon driving, individual level theories are not sufficient for understanding the social aspects of hooning. Surveys in Queensland found that social learning theory predicted more unique variance in willingness to hoon than deterrence theory, highlighting the social nature of hooning motivations (Gee Kee, Steinhardt, et al., 2007; Palk et al., 2007). Presence of a passenger, particularly similar-aged passengers who are

considered risk-accepting and/or antisocial are more inclined to engage in street racing and shown to have an increased crash risk (Mirman, 2018; Voogt et al., 2014). 55% of surveyed drivers who had their cars impounded in Victoria reported hooning with others (Clark et al., 2011).

3.4.1.3 Environmental factors

An analysis of Queensland police impoundment data found that hooning was mostly done on primary arterials (30%), then local roads (20%), secondary arterials (16%) and freeways (14%), and 58% of hooning occurrences occurred between 11pm and 7am (Clark et al., 2011). Hoon driving behaviours tend to occur late at night in an attempt to avoid police (Clark et al., 2011; Newitt, 2012) and not disturb others (Beere, 2007). Hooning is often located distal to hoon drivers' places of residence.

Different types of cars are typically used for different activities. Newer cars are more typical for street racing while older cars were used more in behaviours causing excessive noise or smoke (Leal et al., 2007). A distinction has also been made between cars modified for performance ('go' cars) and cars modified for aesthetics ('show' cars) because having a car that is both beautiful and performant is reportedly expensive (Armstrong & Steinhardt, 2006).

3.4.1.4 Impact of COVID on hoon behaviours and associated enforcement

A study of Canadian drivers in 2020 and 2021 found that incidences of stunt driving increased dramatically during COVID, with a 40% increase in Ontario and 200% increase in Toronto (Woods-Fry et al., 2021). Explanations for this increase include certain groups feeling bored or unstimulated during lockdown when they cannot engage in typical activities, and a perception of decreased enforcement on roads due to police resources being redirected to COVID related tasks (Vingilis et al., 2020). Another finding was that the distribution of speeding offences changed, with less minor speeding offences and slightly more instances of speeding by more than 20km/h above the limit, indicating that some drivers drove more cautiously during the first year of COVID while others engaged in more risky driving (Woods-Fry et al., 2021). See Appendix 5 (Table A5) for further details.

3.4.1.5 Association between hoon behaviours and road crashes

Crashes that are a result of hoon behaviours are likely to be underreported because they are often minor enough that hoon drivers do not need assistance from police or insurance companies. Furthermore, drivers engaging in hoon behaviours may be wary of the repercussions of reporting a crash. A study examining traffic citations found that there was no difference between the crash risk of a driver who had high general citations compared with a hoon driver with street-racing citations (Li et al., 2008), and street racing specifically has not independently been associated with increased crash risk (Kar et al., 2018). Although some studies have showed a link claiming that street racing behaviour was associated with at least five times increased risk of being in a crash, controlling for driving exposure and alcohol and drug use (Vingilis et al., 2014; Wickens et al., 2017). Another study found no association between attitudes towards hooning and self-reported crashes, with a small association between aggressive driving (honking and swearing) and crashes found (Yildirim-Yenier et al., 2015).

A survey in Queensland reported that 20% of drivers who had hooned at least once reported being involved in a crash while hooning, this was more likely with drivers who engaged in racing compared with other hoon behaviours. Of those who crashed 27% were willing to continue hooning (Gee Kee, Palk et al., 2007; Palk et al., 2011). However, the severity of these crashes was not specified.

In Queensland, drivers who had been convicted of street racing were more likely to be involved in a crash compared to a gender and age matched control group (22.3% vs 8.7%), however the severity of crashes did not differ (Leal et al., 2010). An analysis of police offence data found that 3.7% of street racing and hoon offences in Queensland

resulted in a crash, and none of those crashes were fatal (Leal & Watson, 2011). However, a 2008 report from Victoria showed nine fatal crashes since 2003 were due to hoon behaviours (Perry & McGillian, 2008).

A survey in Victoria with drivers who had their vehicle impounded for hoon offences found 15% had been a driver in a crash and 17% had been a passenger in a crash, and of those, approximately half attributed the crash to hoon behaviours (Clark et al., 2011). A survey of medical students in São Paulo reported 43% of those who had participated in a street race had also been involved in a crash (Colicchio & Passos, 2010).

An analysis of crash data in Queensland found that 78% of hoon related crashes were in 60 km/h and lower speed zones (Armstrong & Steinhardt, 2006). A study in the USA reported that street racing fatal crashes were more likely to be on urban roads at speeds above 105 km/h, and that street racing crashes accounted for 0.21% of fatal crashes (Knight et al., 2004).

There is very limited data on the crash risk of specific hoon behaviours such as burnouts and donuts, but they do not seem to have the same crash risk as street racing (Palk et al., 2011).

3.4.1.6 Motivations of car enthusiasts compared to antisocial hoon drivers

Drivers who engage in hoon behaviours often have links with car enthusiast and car modification communities, but not all car enthusiasts engage in hoon behaviours. A survey that recruited participants from car and race club forums in Canada found 20% of their sample reported engaging in risky-driving behaviours (Vingilis, Seeley, Wiesenthal, Wickens, et al., 2013). Responses during focus groups in Queensland suggested an estimated 10% of drivers who attend a car meet on any given night are 'antisocial' hoons, who engage in disruptive and dangerous behaviours unlike the more conscientious 'enthusiasts' (Armstrong & Steinhardt, 2006). These antisocial drivers were described as often younger, and typically mature into responsible members of the scene.

The proportion of drivers who engage in hoon behaviours also varies between car clubs and communities, between and within countries. For example, the ragarre (translated to 'greasers' referring to certain car clubs) in Sweden seem to be very focused on drifting as a core part of the culture (Joelsson, 2014) and there are groups in Australia and the US more dedicated to street racing and illegal cruising, with some members involved in multiple hoon clubs (Hughes, 2018; Newitt, 2012). This is in contrast with other groups that appear exclusively dedicated to car modification and the community it provides without engaging in risky or illegal driving behaviours, for example car modders in Wollongong and Aberdeen (Lumsden, 2008; Warren & Gibson, 2011).

Car enthusiast and racing clubs have their own informal codes of conduct and perceptions of what is and is not acceptable behaviour. For example, in Hamilton, New Zealand car clubs have a code of ethics but with variations between clubs and adherence individually dependent (Beere, 2007). Typically, they choose not to do burnouts in industrial areas during work hours because its impact on others was seen as unacceptable behaviour by the club (Beere, 2007). Focus groups with drivers who had reported hoon behaviours in Queensland indicated that they deliberately go to less populated areas during times when they would not disturb or endanger others to engage in hoon behaviours (Leal et al., 2009). An ethnography in Sweden found that hoon drivers considered those who were unskilled, drunk or lacking awareness of the limits of their competence as the most at risk of crashing (Joelsson, 2014).

Car enthusiasts in Aberdeen, Scotland believed that excessive noise should be expected by new residents in the area where they have been congregating for decades, comparing the situation with expecting to see drunk people if one moved to a popular nightclub district (Lumsden, 2016). However, gatekeepers also noted that newcomers to the scene were more likely to go beyond making noise and engage in antisocial and dangerous driving because they

are not yet familiar with the informal code of conduct and the disapproval of nuisance driving (Lumsden, 2016). There are also some members, including some older drivers, who went against the group norms by speeding in highly populated areas, and who were resistant to requests from gatekeepers in the car enthusiast community to stop (Lumsden, 2008).

Car modding (modifying) is an integral component to car enthusiast communities (Beere, 2007; Lumsden, 2015). Though some modifications are unambiguously dangerous (Lumsden, 2013), the act of defecting modified vehicles can create animosity between police and car modification communities, especially when what constitutes illegal modifications is ambiguous and applied inconsistently, and when vehicles exiting racetracks are sanctioned and therefore perceived as punishment for 'doing the right thing' (Armstrong & Steinhardt, 2006).

Car enthusiasts and hooners are often grouped together in media (Lumsden, 2008). Car enthusiast and modification culture can be a rich source of alternate forms of creativity for civic, economic and social life, and it has been argued that this culture is undervalued by government and wider communities and can face alienation because of the hooning 'moral panic' (Graham & White, 2007; Warren & Gibson, 2011). For many, car enthusiast culture—whether it includes hooning and street racing or not—is attractive because it provides a sense of belonging in a community, self-esteem and sense of actualisation (Hughes, 2018). Furthermore, car enthusiast, modification, or street racing clubs that have existed for a long time and are more "mature" or "socially advanced" engage in pro-social activities with their communities such as charity events, food drives, and outreach (Beere, 2007; Hughes, 2018).

3.5 Research trends identified in the literature

3.5.1 Trends in interventions and legislative treatments

In Australian literature, there was no recent research concerning interventions and legislative treatments, with the most recent published research found in 2015 examining the effectiveness of portable 'slow-down' speed signs in Queensland (Burke, 2015). The most recent study specifically evaluating an intervention was in 2012 examining the South Australia's Task Force Diagonal operation that was successful in shutting down three hoon clubs (Newitt, 2012). Victoria and Queensland have featured most predominantly in the Australian literature. The four studies conducted in Victoria ranged 2008-2014, with a focus on legislation and impoundment laws with one study examining the effectiveness of Operation Stoker in 2004 (Perry & McGillian, 2008). Research in Queensland has ranged 2006-2015 and covers research on legislation generally and impoundment specifically and perception of deterrence and crash outcomes from hoon behaviours.

In international literature, there has been more recent research including two studies in 2021; an opinion piece in the US concerning the inability of automated enforcement as a prevention measure (Hall, 2021) and a study in Israel examining the effectiveness of speed display signs (Siev & Kliger, 2021). Canada and Scotland feature predominantly in the legislation and intervention literature. International research conducted between 2006-2015 has focused on perceptions and behaviour change in response to legislative treatments. Since 2015 there has been a range of interventions examined from technology (for enforcement or vehicle technology assistance) to behavioural interventions to regeneration of urban spaces to reduce hoon behaviours.

3.5.2 Trends in associated factors and motivations for hoon behaviours

There are a greater number of research studies that examine associated factors and motivations for hoon behaviours compared to interventions and legislation evaluations. In the last five years research has focused on the crashes and other risky behaviours that are associated with hoon behaviours. There has been a strong focus on context specific factors including the influence of social media and belonging to a family with a strong car culture. Research over time has continued to look at associated demographics finding that young males still engage in hoon

behaviours more than females. Between 2010-2016, there was a focus on research looking at car culture and the association with hoon behaviours, the influence of media that glorifies hoon-like behaviours, and the psychological factors associated with hoon behaviours. There was also greater emphasis during this period on the frequency of particular hoon behaviours. Prior to 2010 the research concentrated on perceptions of deterrence and the avoidance of police, and the motivations for engaging in hoon behaviours, including rewards, and the notion that hoon behaviours signify youth suggesting the behaviours are transient (Armstrong & Steinhardt, 2006).

4. INTERVIEW RESULTS

4.1 Context

News media was searched to identify Australian jurisdictions that had significant hooning problems or had implemented interventions specifically designed to reduce hoon behaviours in their region. The keyword “Hoon*” was searched in the titles of newspaper articles published in Australia using Factiva—a media search tool by Dow Jones. The search resulted in approximately 12,000 articles and commonly referenced jurisdictions were identified using the “company” search filter in Factiva. Newspaper articles referring to those jurisdictions were then scanned for hooning interventions and potential contacts. To supplement the Factiva search, Google and YouTube searches of “hoon interventions Australia” and other search terms were conducted to find news media not indexed in Factiva.

A full list of the jurisdictions considered for contact for consultations including the interventions specific to each jurisdiction is presented in Appendix 7 (Table A7). Brimbank, Logan, Playford (Adelaide), and Randwick Councils were selected by DoT to be included in the consultations.

4.2 Interview findings

4.2.1 Hooning issues identified

All jurisdictions consulted had been identified as hotspots for hoon behaviours receiving multiple complaints for hooning every week from communities. Excessive speeding was reported by participating jurisdictions’ representatives as a hooning issue often reported by community due to the associated noise and high risks to the safety of residents. Excessive speeding has been identified in data collected by one council that ranges in the 95th percentile of speeds recorded. One interviewee provided a formal definition of hoon behaviours which has informed their approach: *Deliberately drives a vehicle in a reckless or dangerous manner, generally in order to provoke a reaction from onlookers. Hoon activities can include speeding, burnouts, donuts, or screeching tyres.* Another jurisdiction representative identified the noise issue of performance driving such as donuts and the number of spectators this can attract. Hooning was identified as an important issue due to the damage, noise, associated vandalism and litter that occurs. The issue of motorcycle hoons was raised. These hoon riders are challenging to police due to their speed, easy access to off-road locations, and are often unregistered.

Most jurisdiction representatives recognised hoon behaviours as a public safety issue rather than a distinct road safety problem. One jurisdiction had approached the issue of hoon driving with an understanding that it is a complex public safety *and* road safety issue. In another jurisdiction it was reported that hooning is seen *as a residential amenity problem*. Yet the road safety issue was raised: *I’m not certain that there’s been any incidents from a road safety perspective, but they are doing illegal stuff by doing donuts or driving ferociously, and there is a risk that’s associated with that type of behaviour.* Hoon behaviours and gatherings were mostly reported to occur in industrial areas away from the general community. However, the road safety risks of all involved including hoon drivers, passengers, and spectators were identified as at risk of serious injury or fatality. During one consultation it was commented that people sit on top of vehicles, in tray backs of utes, and on the boots of vehicles while hoon drivers skid and drive recklessly: *I’m surprised we haven’t lost more people.* Injured spectators had also been witnessed fleeing a hoon event to avoid police, regardless the severity of injury.

The change in hoon behaviours over time was identified in one jurisdiction: *go back early 2000s there were planned events, hooning, that was more street racing, quarter mile type runs... and generally in industrial areas and on our [location] motorway... that's continued on despite a number of enforcement strategies that we've tried. Over the last few years, that sort of changed into more of the skidding/burnout type offending. Which is again... concentrated in industrial areas and that sort of thing. But we've also noticed a shift in behaviour of those individuals, so they're now more planned and some groups are highly aggressive and confrontational with officers.* Some of the larger organised groups were noted to be sophisticated in their organisation of hoon events and work to prevent or block police including 'cockatoos' who keep watch for police presence and surveillance.

4.2.2 Legislation and Interventions

4.2.2.1 Legislation and enforcement

The need for enforcement and a close relationship between local council and police was a recurring theme among jurisdictions. One jurisdiction, where the coordinated efforts of police, councils and transport department were apparent, allowed for enforcement efforts to be directed at hoon gatherings, yet police would also assist council with public safety concerns from community reports of hoon behaviours. One jurisdiction focused on excessive speed as a hoon behaviour requiring police intervention, providing data to police to inform specific areas to target: *If it's a hoon issue, it's going to ... police. If it is, per the system, a speeding issue, it becomes for the council.* Given the focus on road engineering by this jurisdiction to address hoon behaviours, if excessive speeding was not a regular problem on a specific road, police were contacted to address the issue.

Two jurisdiction representatives, despite recognising the benefit of council and police collaborating to target hoon behaviours, approached the issue as more of a police matter, with council limited to implementing engineering interventions: *You know, they [communities] say Council's gotta do something about it. Well, we can do some physical stuff, but we can't undertake any enforcement. Or any criminal or vandalism type things, we can't take any action. That's up to the up to the police. Even when we get told about it [hoon behaviours], we basically say, you know, it's really a matter for police. And when we tell the police, they'll say 'well with our limited resources and with our major focus of our local police command is domestic violence'. So, they'll be allocating units to other areas of the Council to deal with domestic violence issues as a higher priority than traffic control in these areas. So, the residents are understanding of that position, but they are peeved that they're not getting the attention that they would like.* One of these jurisdictions had also attempted to implement noise and emission defect stations, but these were unsuccessful with messaging and social media notifying hoon drivers who then just avoided the locations.

One jurisdiction had introduced a successful by-law eradicating hoon gatherings from their council area. The by-law allows police to issue substantial fines to anyone spectating or recording hoon behaviours. A main motivation behind hoon behaviours was believed to be spectators, including other hoon drivers and young women whom the predominantly male hoon drivers aim to impress. From experience with working with police on hoon events, it was commented that *if there's no people there watching, a lot of the times they won't do it.* In jurisdictions where spectator fines are not included in legislation, during COVID lockdowns, when police had powers to issue large fines to those who disregarded restrictions concerning public gatherings, this punishment had a similar functionality. The large fines had a positive impact on hoon gatherings: *We did notice a knock-on effect where they knew that they were going to get punished fairly hard, so we noticed a significant drop off (of hoon gatherings) in the following weeks after that.*

The idea for the previously mentioned by-law allowing spectator enforcement was raised during the 10-year local government law review by a police officer: *The initial idea, the initial impetus for it came from a member of the police, who said that 'we don't have the adequate tools in our toolbox when we leave the station to be able to deal with this—we've got road safety stuff, but we don't have anything that addresses what we thought was one of the major problems and that's the spectators'*. The enactment of the by-law was without issue. An initial concern was how the magistrates court would handle the by-law, but that did not become an issue. Criticisms came from state ministers who thought the by-law was not within the scope of local government and was *exceptionally harsh for a local government to bring in*. Hoon drivers expressed negative opinions and felt like they had been targeted, specifically young drivers: *We've been accused of targeting young people and things like that and we make no apologies for the fact that we are targeting offenders*.

In this jurisdiction there have been no fines issued to hoon drivers in the last two years and no known hoon gatherings: *I don't think I'm overstating it to say that no one could anticipate how well this had worked... When we did it, we were hoping for a minimisation in hoon activity within the LGA. Based on stuff we're getting back from the state police taskforce, we've eradicated it. We still get the one-off stuff that is dealt with under existing road safety provisions, but when it comes to organised hoon events, they don't occur*. As anticipated, neighbouring jurisdictions have had an increase in hoon behaviours: *the hoon activities still occur in our region, just not on our local government patch with hoon event organisers know[ing] our council boundaries better than we do*. There have been suggestions that state government are considering hoon spectator laws which may have a broader impact across the state, however, there are concerns within the interviewed jurisdiction that hoon events may return. It is believed that the fine amounts in state-wide legislation would likely be less than this jurisdiction who believed the severity of their fine contributed to the success: *comments from spectators at these events saying, 'If I'm getting a \$800 fine just for watching this thing, I'm not going'*.

The success of the by-law was attributed to immediate and obvious enforcement: *Police were very enthusiastic to support it and it was only successful because they were on board*. When police covertly surveyed an event shortly after the by-law was introduced, a post was made on social media notifying the community fines had been sent to hundreds of people who attended. Multiple calls were received from attendees to pay the fines in advance, most likely to avoid explaining the fine to parents, highlighting the younger demographic of hoon drivers and spectators. The ongoing success of the by-law was also attributed to enforcement: *The only reason it is now continuing to work is because of that cooperation [with police] and the fact that it is so responsive, that if we get wind of something happening then we know that the only way it will continue to work is if they continue to fear the fact that it [spectator fines] is still an option. If an event was to go off and nothing happened, then I think they would start to test it again*.

In other interviewed jurisdictions, the request for overt cameras in known hoon spots has resulted in cameras being vandalised, or CCTV cameras have been installed but do not provide high enough image quality to be useful for police. Yet in other jurisdictions where vehicle clear capture cameras (VCC) and bullet cameras have been trialled, there were reports of success in police being able to identify the driver and number plate. These cameras have been rolled out to additional locations after the success of the trial. One example of the success was shared: [hoon behaviours] *certainly have stopped in the [location] industrial area*. When hoon drivers know they can be caught via these cameras, and police take action to locate hoon drivers, there is a positive result with hoon behaviours in the location no longer observed. One location has used social media for intelligence gathering finding hoon drivers are aware of camera locations but were unaware of the capabilities of VCC cameras.

In regard to community reports to police of hoon gatherings, one interviewee noted that when concerned community members contact the police the hoon gathering will disband and return after a few hours to continue. Another jurisdiction reinforced the extent that hoon drivers may go to in order to avoid police: *A young girl was injured at one of these [hoon] events and suffered some fairly serious injuries to her lower legs, they didn't call an ambulance, they threw her in the back of the car and drove her to a hospital so that there was no pressure on them at the event.*

4.2.2.2 Education and engagement

Jurisdiction representatives discussed extensive engagement with community prior to implementing interventions, for example the by-law for hoon drivers and spectators which was recognised by community: *The community love it. They absolutely love it.* In another jurisdiction where road engineering was discussed extensively, community engagement was considered critical to each change made. One jurisdiction has made efforts with community to explain the safety perceptions and mental impacts of hoon behaviours in order to encourage accurate reporting. This jurisdiction focuses on empowering communities to take action. This has included upgrading the online reporting system that the community members had found difficult to navigate. This system has been marketed as an easy-to-use way to help police respond to hooning issues. This update resulted in an increase of reports from the community. Empowering the community to report hooning was important: *because it's very easy to turn around and say, well, police aren't doing their job, but they can't do their job without the community supplying that information.* The success of this marketing campaign was largely attributed to the action that police took, delivering flyers (including how to report and a QR code to link to the online reporting system) to communities where hoon behaviours were identified. This communicates police awareness of the issue. Most interviewees recognised that communities struggle with fear of retaliation from reporting hoon behaviours.

One jurisdiction initiated a task force that developed an action plan to address advocacy, enforcement, target hardening, education, and technology. Businesses have been engaged via the provision of grants to contribute to the installation of CCTV with the requirement that footage be available to police. Efforts have been made to educate businesses and communities regarding responsible methods of tyre disposal. Easy access to used tyres by hoon drivers is a distal factor that contributes to hoon behaviours. Though this task force is no longer active, the initiatives are ongoing: *from the campaign we were able to establish what actually worked, what was the best methodology and that then funnels into our BAU [business as usual] and also the relationships built (with police).* The interventions implemented are currently being formally evaluated by an independent research institution.

Legal and/or safe means of engaging in hooning behaviours were commented on. One jurisdiction representative said this had been discussed and that there are already major raceways within the greater metropolitan area that can be used, and that council is willing to support anyone who wants to plan safe and legal driving events at these venues. However, official events were speculated to not be as popular among a particular group of hoon drivers for whom the illegal and anti-authority nature of hoon behaviours is part of its appeal: *Motor sport enthusiasts who like drift racing and things, they'd go [to official racing or drifting events], but we're not sure if, you know, little Johnny with his Commodore that he's worked the motor to within an inch of its life and whacks on a crappy set of tyres on a Saturday night so he can go out and make smoke, we're not sure he'd go.* With regards to building new venues, it was commented that limited funds are a barrier for local governments, and: *last time I checked there are other activities that are illegal that we don't give you places to do it.*

Interviewees commented that organisers of hoon events are not easy to identify and therefore also difficult to engage. Organisers use various Facebook aliases and advanced encrypted messaging services. *If we could get in*

touch with the organisers and get through these 50 million aliases they operate under, then we would organise something [engagement] properly. Another interviewee commented:

If we become aware of an event, we have reached out to some in the past and some have been receptive to that and have been engaged. Others are extremely anti police and it's a complete waste of time, they're either not going to talk to us or we can't find them to start with.... Some of what we could achieve was done through social media. So if we got wind of something we would have Intel capacity to try and look at that but even that's extremely limited, because they're very guarded about what they release, who they release it to, and all of that sort of thing. So if we got wind of something we've monitored through social media, we'd know who the administrators were of that, but again, these administrators are very anti police for the most part, for the problem groups. So yeah, any sort of negotiation or liaising with those people generally was a waste of time.

Hoon drivers were also commented to be *exceptionally difficult to engage with*. A representative from one jurisdiction stated that most interaction was in the form of angry letters after a hoon driver receives a fine. An interviewee in another jurisdiction iterated that jurisdiction's support for car enthusiast meetups: *If these people would come out of the shadows and talk to council, we would be happy to work with them to stage a car enthusiast event to try and get that participation because, with the two events that have taken place, we've shown that if you do it here, it can be done safely and you can do it well... the police were there on the night, both of them, and there was no animosity on the night on a large scale... The interaction between police and the car enthusiasts was great. We would draw a line between the fact that there are hoons, and there are car enthusiasts.*

4.2.2.3 Engineering

An interviewee commented that all Australian states provide guidelines that outline details to inform decisions regarding the type of road engineering response to implement to reduce hoon behaviours. One jurisdiction mentioned that new land developments were taking into consideration road design to mitigate potential hoon behaviours.

Expense is a consideration when determining road engineering as a solution to hoon behaviours. One jurisdiction representative commented that concrete islands are often a cost-effective solution over, for example, *islands with flower beds that filter rainwater*. Concrete islands are implemented explicitly to prevent burnouts, with consideration given to roads' accessibility and driveways. Skid resistant road treatments are among the more expensive options to slow traffic. Some jurisdictions disregarded the option due to the expense, but others were in favour of using this to prevent loss of traction engaged in by hoon drivers as the treatment will wear tyres quickly. However, some hoon drivers aim for a tyre blow-out as this is popular with spectators and therefore this treatment can be encouraging of loss of traction behaviours. Another jurisdiction used skid resistant road treatments to prevent excessive speeding of heavy vehicles in a particular location and commented: *from a council perspective it is expensive*. While expensive both heavy vehicle and motorcycle crashes are reduced with this treatment and are among the most successful for reducing motorcyclist injury severity (Budd et al., 2018; OECD/ITF, 2015). Therefore, skid resistant road treatments are worthy of consideration and an overall cost-benefit analysis warranted rather than only considering the costs associated with reducing hooning behaviours.

Speed humps are a commonly proposed solution to hoon behaviours. Noise complaints have been reported in response to vehicles travelling over the speed hump and others report hoon drivers using the hump to engage in hoon-like behaviours. One jurisdiction explained that community consultation is critical prior to implementing permanent speed humps and each road environment and community context will differ in respect to whether this is an appropriate solution. Temporary road cushions were not considered an effective solution and were

commented to be a short-term solution and difficult to change due to the need for community involvement. Indeed, rubber temporary road cushions have been known to encourage hoon behaviours with the friction provided an opportunity for hoon behaviours. Another jurisdiction representative commented that community is consulted before installing speed humps if they were to be installed near residences. In that jurisdiction, these were reported to be somewhat effective: *because a lot of them have lowered cars, they didn't like these speed humps. So, they're using this street less.* The community supported the speed humps, which was commented to be unusual and suggesting some desperation for something to be done about the hoon behaviours. Rumble bars have also been added to deter vehicles with lowered wheels, though there was one case where the hoon drivers simply removed the rumble bars.

Another jurisdiction has added single-lane slow points and speed humps to prevent racing. This was initially trialled and then added as landscape elements, however, there have been some issues: *During summer there's quite a flow of traffic towards the beach and some residents have said that's problematic because it gets choked.* Hoon behaviours additionally relocated *and now the residents along this street, which is another link to the arterial road system... they've asked for some respite, and so we're gonna do a similar process here, trial some speed humps this year and then this summer and then see if we put permanent installations.*

No stopping signs have also been used as an attempt to stop hoon gatherings yet comments by most interviewees was that they doubt the effectiveness. However, signs in combination with mobile cameras were utilised in one jurisdiction that found the solution to be an effective deterrent. No stopping signs were particularly useful in one jurisdiction where police were *limited in legislation for enforcement*, so no stopping signs gave police power to disband hooning events, including spectators, even if they had no evidence of hoon behaviours. In another jurisdiction, no stopping controls for specific times of night (10pm to 3am) were implemented on the non-residential side of a street. *There was a bit of disquiet until we did this. There were some residents yelling out complaints... And then some stones going through windows coming back the other way. So, it was quite hostile for a while.* The signs were commented to be successful in reducing these incidents.

Artistic treatments on the road where paint colours offer high contrast to the road has been used in CBD locations yet commented by the jurisdiction representatives that this is not necessarily an effective deterrent to hoon drivers.

One interviewee explained how gating has been used in a particular location to prevent hoon driver access and the performance of donuts that had been common in the late evening. Gating became an issue for people who were fishing or scuba diving who would become locked in. The road was modified to a one-way road that police can gate off in the evenings, but people can still leave. Police can then check if any cars entered via the roads exit later that evening if they were not there when they closed the gate. Whether cars who enter the closed road can be booked *depends on which police you talk to. Some say yes, I can book them because you know, if we find this white car and he wasn't on our list, then he must have come in the wrong way. Therefore, I'll issue a ticket to the driver. Some police have been very cautious and say well, unless I see the driver do that, then I can't issue a ticket. So, it depends on how gung-ho the police want to be.*

4.2.3 Motivations for hoon behaviours

Comments were made by jurisdiction representatives that hooning activities particularly occurred during the evenings and often on weekends. In one jurisdiction, the problem with hooning was indicated to be seasonal with more issues occurring in summer. Speed-related hoon behaviours were identified as occurring on wide, straight roads where road engineering efforts to intervene were relevant. It was often noted that industrial areas away from residents were favoured by hoon drivers when gathered as groups. However, a distinction was made with the more

spontaneous hoon behaviours like the *kid at 5:00 o'clock every morning who has to do his burnout to get out the street to get down to his job* that can be more disruptive to local communities.

It was commented by most jurisdiction representatives that hoon drivers are predominantly young males, however, there was some suggestion that middle-aged hoon drivers were also prevalent. In one jurisdiction the age range is typically 15 years -mid-40s, with cases of parents engaging in hoon behaviours with children present in the vehicle: *The driver of a vehicle with infants in the car did a skid and ran from police, so he's dumped his car and run, leaving the kids in the car. Like it's, yeah, it's very wide-ranging.* One interviewee said hoon drivers were typically of low-socioeconomic status, with more wealthy car enthusiasts more likely to cooperate with police and council: *Low socioeconomic people, if they do rock up [to car enthusiast events], they're generally told to leave [by event organisers] quite quickly.*

One jurisdiction representative gave a specific example of the association between attending car enthusiast events and consequential hoon behaviours occurring when leaving the event with the example reflecting a road crash fatality: *There was a fatality down here a few years ago where a car had been involved in a hoon activity in another council, participants were travelling away from the event and two of the participants decided to have an unofficial race on one of our major roads... and one of those cars went off a bridge and the participant died in that.* In this same example, it was recognised that hoon drivers may engage in other risky and non-compliant driving behaviours: *The other person that was racing him was charged with vehicle offences and driving offences.*

A clear distinction was made by most interviewees between the car enthusiasts and hoon drivers. It was commented that car enthusiasts drive expensive vehicles, with investment made into modifications. Hoon drivers have less expensive vehicles with crude modifications: *They're different cohorts. You will find that at these car enthusiast events there are cars that you would never use for hooning because they are expensive pieces of machinery. You can look at them and see a lot of love has gone into that car. Then you have the separate group who have a car that they've done a bit of work on the engine of. Externally it doesn't look that great. And you can often pick them because they'll be driving up the road, you'll hear the car coming and as they drive past you look at the back tyres, and if they've got a good set of tyres on the front and a really crappy set of tyres on the back, that's normally indicating that they're involved in that sort of stuff [hooning].* Another interviewee commented, *We've got people doing a skid in unroadworthy vehicles that are generally modified to assist them in performing the skids, whether that's modifying braking systems, welding dips, so that the wheels can spin at the same time. They're doing these skids in very close proximity to large gatherings of people.*

Another jurisdiction, however, conflated car enthusiasts and hoon drivers: *They sort of make noise going along there, motorcyclists and car enthusiasts. And then they like to get down to [suburb] and there's a whole lot of angle parking here where they sit and admire each other's cars and carry on etcetera... so they do burnouts here.* In this jurisdiction, drivers who engaged in hoon behaviours visited from other suburbs and *tend to have a Middle Eastern background. They tend not to be drinkers of alcohol... So, we don't have any indication of drink driving.* This was noted to be unlike the interviewee's previous experience where *sometimes it's been the car enthusiasts who get drunk and then do stupid things.*

Spectators of hoon events were sometimes highlighted as an integral part of the hooning problem, while in one jurisdiction, groups of cars would visit the area and engage in hoon behaviours without attracting spectators. This could be attributed to the fact that hoon drivers in that area travel from distant suburbs. One jurisdiction that reported spectator problems was also the LGA where spectators of hoon behaviours can be fined.

4.2.4 Outcomes of interventions

The introduction of a by-law that includes a fine, perceived by hoon drivers to be severe, and targets spectators in addition to the hoon drivers' law was reported to be successful in eradicating hoon behaviours and large gatherings from the jurisdiction. Hoon behaviours were recognised to have shifted to neighbouring jurisdictions.

Though hoon behaviour has been eradicated in response to the by-law, organised car enthusiast meetups continue and attract a high police presence. Meetups have caused minor issues with disruption to local business, however, no hoon behaviours were observed. Instances of hooning around those events include when attendees leave and cross the LGA's boundary where the by-laws are not in effect.

Unintended consequences from the introduction of legislation and eradication of hoon behaviours was identified with local highway patrol reporting an increase in resources to dedicate to road safety matters; hoon events would often require up to six police cars.

One jurisdiction commented on hoon hotlines, having persisted with this approach for six years, yet the issue of hoon behaviours remained. However, for another jurisdiction, hoon reporting systems have been instrumental in empowering the community and supporting police operations. Improving the usability of the online reporting system, as highlighted by the community as previously difficult to use, and marketing the changes, has been an integral part of this jurisdiction's hooning action plan.

5. Conclusions

5.1 Summary of key findings to inform future hoon behaviour interventions

- Coordinated efforts and collaboration between councils, police, and transport departments are important to the success of hoon behaviour initiatives.
- A key challenge in addressing hoon behaviour is to identify sustainable and cost-effective solutions. Increased resource allocation for police is costly over time. Road engineering interventions, such as skid-resistant road treatments, are expensive and could simply result in hoon behaviour locations changing once deemed unusable, rendering such efforts futile. However, broader considerations should be made where, for example skid-resistant road treatments can additionally impact improved crash rates for heavy vehicles and motorcyclists.
- Research has demonstrated that the implementation of an intervention in one location does tend to result in it relocating to another area rather than deterrence or prevention of hoon driving behaviours. Therefore, this is an important consideration of any intervention.
- Enforcement initiatives need to heighten the perceived certainty among hoon drivers that they will be caught, as many currently believe that this is unlikely. A multi-disciplinary approach is considered the most effective with a case management style of intervention proposed.
- Ensuring that hoon-related legislation is adequately understood by community and police is an important consideration; particularly knowledge concerning vehicle modification, in order to reduce the perception that hoon drivers are being targeted due to vehicle modifications rather than the potential risk of injury.
- Self-policing within more mature car enthusiast communities can result in a culture that is more critical of particular antisocial behaviours (e.g., Hamilton, New Zealand and Aberdeen, Scotland). Engaging with car

enthusiasts to gain an understanding of the different communities could inform practical interventions in jurisdictions where an overlap between the enthusiast communities and drivers who hoon can be identified.

- Engaging with the broader community to understand their needs prior to implementing any intervention, road engineering or otherwise, is important.

5.2 Summary of findings on the effectiveness of interventions

Table 5. Summary of findings on the effectiveness of interventions

INTERVENTION	EVIDENCE FOR EFFECTIVENESS	RISKS	DETAILS OF EVIDENCE FOR EFFECTIVENESS
Impoundment and forfeiture laws	Strong (some mixed)	Risky chases to evade forfeiture	<p>Strong evidence for impoundment laws reducing crash related deaths and injuries in Canada (Gargoum & El-Basyouny, 2018; Meirambayeva, Vingilis, McLeod, et al., 2014).</p> <p>Evidence that forfeiture ordinance had a strong effect on reducing illegal street-racing related fatalities in San Diego (Worrall & Tibbetts, 2006).</p> <p>In a Victorian study, majority of driver’s caught hooning self-reported that they had not hooned since having their vehicle impounded (Clark et al., 2011).</p> <p>From ethnography in New Zealand, impoundment laws pushed ‘boy racers’ to less monitored areas instead of decreasing hoon behaviours (Beere, 2007).</p> <p>Risk of dangerous police chases to avoid forfeiture. According to focus groups in Queensland, drivers who had been caught hooning claimed that they would be more likely to risk their lives and evade police than forfeit their car (Leal et al., 2009). However, very few drivers in Queensland have been charged with a third or fourth hooning offence (Leal et al., 2007).</p>
Spectator fines	Moderate		<p>Evidence that spectator ordinance in San Diego slightly reduced illegal street-racing related fatalities, and the effect was much smaller than for the forfeiture ordinance (Worrall & Tibbetts, 2006)</p> <p>Data from consultations showed that spectator fines were very effective for pushing hoon events out of a local government area.</p>
Enforcement operations	Depends on laws and operation	Short-term effects; may lead to relocation of the problem	<p>‘Task Force Diagonal’ in Adelaide stopped the operations of three major hooning clubs according to a report by SAPOL (Newitt, 2012).</p> <p>‘Hoon Squad’ in Queensland in 2002 had a reportedly big impact on hooning related impoundments, but believed that hooning would return to previous levels if hoon squad were to cease operations (Folkman, 2005).</p> <p>Ethnography in a Southwestern USA city showed that street racing clubs are confident in their ability to avoid police (Hughes, 2018).</p>
Cameras/signage at hotspots	Weak / unclear		<p>Anecdotes from media reports that fixed cameras have not been effective for prosecuting and preventing hoons. No published evaluations of the usefulness of cameras for hooning prevention or support for enforcement.</p> <p>Research on speed signs and adaptive signage only considers the general driving population rather than hoon driving or street racing (eg. Siev & Kliger, 2021; and Burke, 2015)</p>

Defecting modified vehicles	Weak / unclear	Confusion for car enthusiasts	<p>Focus group respondents in Queensland thought defect enforcement was inconsistent and felt unfairly targeted especially when leaving sanctioned racing events (Armstrong & Steinhardt, 2006).</p> <p>No published evidence on the effectiveness of defecting modified vehicles for increasing road safety.</p>
Safe hooning spaces	Weak	Acceptability of risky driving	<p>Evidence that an increase in sanctioned racing events in San Diego had a very weak or nonsignificant effect on reducing street-racing related fatalities (Worrall & Tibbetts, 2006).</p> <p>After Adelaide's first Grand Prix and Melbourne's first Formula One races, crash rates increased on the roads that were used for those races (Vingilis & Smart, 2009).</p> <p>Idea to increase access to legal car sport venues is popular with those who have been caught hooning (Clark et al., 2011).</p> <p>Interventions like Operation DRAG in Warwick where at risk youths were taught mechanics and given access to a safe race course have been attempted but not formally evaluated (Folkman, 2005).</p>
Traffic calming devices	Weak	'Fun' for hoons	<p>News reports and council websites claim that traffic calming devices like speed bumps are not effective for reducing hooning behaviour, and may be considered fun by drivers who hoon. No published evaluations of traffic calming devices for reducing hooning or street racing were found.</p>
Hoon reporting hotlines	Weak		<p>Data from consultations suggest that hoon reporting hotlines had little effect on reducing hooning or supporting police operations.</p> <p>Focus groups with drivers caught hooning show that reporting hotlines are perceived as the least likely reason for them to be caught (Clark et al., 2011).</p>
Community outreach	Not evaluated		<p>Interventions like Operation YARD in Queensland where students have been educated on reckless driving risks have been attempted but not formally evaluated (Folkman, 2005).</p>
Regulate risk-glorifying media	Not done or evaluated	Unnecessary censorship	<p>Social media and YouTube have been identified as online spaces where hooning is shared and encouraged (Vingilis et al., 2017). Video games and movies have also been loosely connected to street racing behaviour (Vingilis, Seeley, Wiesenthal, Wickens, et al., 2013).</p> <p>These papers call to regulate risk-glorifying media, but nothing has been published describing or evaluating any attempt to do so.</p>

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APPENDICES

Appendix 1 – Definitions of hoon behaviours identified in the literature.

Table A1. Definitions of hoon behaviours identified in the literature

Term	Definition
Boy racer	People who engage in illegal street racing, and legal or illegal car modification. Typically used in UK and New Zealand.
Burnout/wheelspin	Loss of traction event where the vehicle is relatively stationary while the drive wheels spin, maintaining loss of traction with the road surface creating noise, smoke, and leaving a mark on the road.
Car enthusiast	Car enthusiast communities can overlap with street racing and hooning, but not always, with some members of the car enthusiast communities taking steps to make their image more respectable.
Car modding / modders	Car modding (modifying) is often done by car enthusiasts and/or street racers, usually to make their car aesthetically appealing or perform better (speed, handling, etc.). Car modding can be legal or illegal (eg. too loud, too low, windows too dark, unsafe), with illegal car mods sometimes being 'defected' by police.
Convocation/rolling roadblock	A row of vehicles driving across lanes on a motorway to block a section of road off from public traffic. Done to facilitate racing without endangering other drivers.
Donut	Loss of traction event where the vehicle is drifting in a circle, causing smoke and noise, and leaving a 'donut' shaped mark on the road. When moving in a wagging fashion, this is called a 'fishtail'.
Drifting	Loss of traction event where the vehicle is in motion, typically turning a corner, while the drive wheels lose traction with the road. Can be done to attempt to turn corners at high speeds during races, or for the thrilling experience.
Excessive noise	When sound at a level that is considered disruptive to others is produced by a vehicle, either through loss of traction, modified sound speaker systems, or modified exhaust.
Excessive smoke	When smoke is created by a vehicles tires losing traction with the road (eg. A burnout) or from a modified exhaust system.
Ghost riding the whip	Stepping out of a vehicle while in motion and dancing beside or on top of the vehicle. Also called 'ghost riding the whip' and was popularised from the rap song "Tell Me When to Go" by E-40 in 2006.
High range/excessive speeding	Speeding at least 40 km/h above speed limit. What is considered excessive varies between state and country.

Term	Definition
High-range/excessive/ extreme drink driving	Driving with a blood alcohol content higher than 0.10 g/dL (Victoria) or 0.15g/dL (Queensland) can result in vehicle impoundment under anti-hooning laws.
Hooning	Australia-specific term for street racing and related behaviours. Can be defined as any behaviour that can result in vehicle impoundment under each state's 'Anti-Hoon' laws including deliberate loss of traction, and excessive speeding.
Kortteliralli	Finnish for "cruising around the block". Typically refers to a culture of young, often working class Finnish people who modify, race and drift their cars. Also kaahailu, which means "speeding"
Loss of traction	When a vehicle's wheels lose traction with the road surface. Can be facilitated by pouring oil or other substances on the road. Loss of traction activities include burnouts, drifting, and donuts.
Met Rampit	Young men who engage in illegal motorcycle races and stunt riding. Also related to other organised crime. Term exclusively used in Malaysia.
Ragarre	Swedish for 'greaser'. Typically refers to Swedish car enthusiasts and street racers. Sometimes also 'volvo ragarre' or 'volvo girls'.
Street racing / drag racing / speed trial	Any competition between vehicles on public roads to reach a location before another vehicle (race) or before a predetermined time (speed trial). Can be highly organised or spontaneous, and can take many different forms (eg. Cannonball, hat race etc.). Street racing is the one term that seems to be consistently used across English speaking publications.
Stunt driving	Street racing related behaviours such as loss of traction events and driving without control of the vehicle. Typically used in Canada.
Tafheet	Drifting on wide, flat straight road section. Also referred to as Saudi Drifting or Middle East drifting. The term is used predominantly in Saudi Arabia.

Appendix 2 – Literature concerning hoon behaviours interventions implemented in Australia

Table A2. Literature concerning hoon behaviours interventions implemented in Australia

REFERENCE	OBJECTIVE	INTERVENTIONS	METHODS AND RESULTS	COUNTRY/ JURISDICTION	HOONING BEHAVIOUR/ HOW HOONING IS DEFINED	RESEARCH QUALITY RATING
(BURKE, 2015)	Test if portable speed warning signs (the signs that tell you to slow down) reduce speeding	-Portable speed warning signs in Brisbane did result in a decrease in the number of instances of speeding.	-26 portable warning signs were moved around Brisbane 175 over 17 months from November 2013. -25.1 million instances of motorists passing the signs.	Queensland	-Paper is not hooning specific, but mentions hooning as an example of poor driver behaviour in the abstract.	2
(VOOGT ET AL., 2014)	Literature review of associations between age and characteristics of risky young drivers	[note: review paper, not primary source] -In section on 'hoon driver's attitudes towards legislation and enforcement, the authors argue that this particular population does not seem to respond to punishment severity. They cite the finding by Leal et al. (2010) that there is a positive correlation between perceived severity of legislation and likelihood of future hoon driving according to their survey. They also cite Gee Kee, Steinhart and Park (2007) finding that only 6% of unique variance in willingness to engage in hoon driving could be predicted by deterrence measures.	-Literature review -Searched risky-, dangerous-, drink- and drunk- driving, hoon and speeding, and street- and drag- racing in psychology and sociology databases. -Search result had 2035 papers, 33 selected from screening.	Victoria (Deakin) but with general implications	Very broad definition: "For the purposes of this paper the terms 'risky', 'unsafe', 'hazardous' and 'dangerous driving' are used interchangeably to refer to any driving behaviour that is intentionally antisocial or has the potential to cause a traffic collision or road injury and is engaged in due to perceived positive outcomes for the driver." (p51)	n/a
(NEWITT, 2012)	Report on operation to stop hoon clubs, written by police	-South Australian Police instigated 'Task Force Diagonal' to enforce hooning laws and address 3 popular hooning clubs in Adelaide in 2010. -First engaged with the clubs and promoting safe and legal cruises and club behaviour, but when that was disregarded SAPOL created the taskforce -206 arrests/reports, 614 vehicles 'defected', and 102 vehicles impounded. -The targeted hooning clubs then ceased operations	-Report by a Detective Inspector summarising police operation.	South Australia	"Hooning activities generally involve 'misuse of a motor vehicle' as defined by the Road Traffic Act (SA) and include behaviours such as driving at excessive speed, 'street racing', wheel spinning, burnouts, noise generation and disturbance, and causing damage to road surfaces." (p42)	n/a
(CLARK ET AL., 2011)	Explore effectiveness of vehicle impoundment legislation	-77% of participants knew about legislation before getting caught (55% heard about it from TV, 20% from word-of-mouth). -Participants typically did not feel like their impoundment was fair, with a lot of talk about how 'other' (often younger male) hoons who hoon in urban areas for peer attention are the dangerous ones. -The greatest inconvenience from Vehicle Impoundment legislation was fines/associated costs for 32% of respondents, not having vehicle access (30%), having a conviction (25%), and the possibility of harsher future punishments (13%). 55% of respondents thought the penalties were too harsh, while 39% thought they were fair. 51% of respondents reported yes to 'are the current punishments harsh enough to deter future hooning?'. -Perceived likelihood of detection was mixed.69% reported police patrol as most likely way to get caught, followed by speed cameras, then witnesses, then hoon hotline as least likely. -71% reported not hooning after impoundment. first impoundment. which in Victoria is 48 hours. However, responses to the item about how often they've been hooning in the last month showed only 13% reporting hooning zero times in the last month.	-Analysis of Victoria Police impoundment data. Most participants contacted from Impoundment Unit + snowball procedure. -Survey completed by 52 drivers whose vehicles had been impounded (50 male, 2 female, 16-46 years old with 83% younger than 28 years old) -Focus groups conducted with 21 respondents (18 male, 3 female) in two groups. -65% of respondents had 1 offence. 38% did 'loss of traction' resulting in impoundment, 37% were speeding 45-120 km/h over limit.	Victoria	Losing tyre traction, causing excessive smoke and noise. Speeding > 45 hm/h over limit	2

REFERENCE	OBJECTIVE	INTERVENTIONS	METHODS AND RESULTS	COUNTRY/ JURISDICTION	HOONING BEHAVIOUR/ HOW HOONING IS DEFINED	RESEARCH QUALITY RATING																																							
(WARREN & GIBSON, 2011)	Reframe discussions of custom-car culture in Woollongong	<p>-For the survey question ‘what would deter you or others from hooning?’, 21% reported access to legal car sport venues, second most common was nothing can be done, and third most common was increasing penalties and enforcement. Similar question with focus groups was met with the suggestion to have a weekly meet on a public race track.</p> <p>-Participants suggested that car crushing would result in hooning with cheaper cars, or evading police if driving an expensive car.</p> <p>- Some participants in a focus group acknowledged that speed limiters would deter them, though there was an overall sense that they would be ineffective (“it’s the driver not the vehicle”)</p> <p>- Current city planning and enforcement strong-arming is argued to be demonising a legitimate form of creative and cultural expression in the custom-car culture in Woollongong.</p> <p>-For example, Woollongong Revfest 2008 was cancelled last minute by the city.</p> <p>-Custom-car cultures could be treated more sympathetically.</p>	-Responsive ethnographic methods in Woollongong. Car enthusiasts were contacted through personal networks and car clubs.	NSW, Woollongong	‘Hooning’ is considered a moral panic, a tool to alienate car enthusiasts from the community.	n/a																																							
(ALEXANDER ET AL., 2010)	Survey community attitudes to risky driving countermeasures	<p>-When participants were asked if the 48 hr, 30 day and permanent impoundment punishments for 1st, 2nd and 3rd hooning offences (respectively) were adequate:</p> <p>--Majority reported that 48 hr and 30 day impoundment periods were not tough enough, and that permanent forfeiture for 3rd offence was ‘about right’. 70% supported 1st offence resulting in 30 day 2007impoundment, and 55% supported car crushing instead of forfeiture.</p> <p>-Generally, younger respondents (18-25 years) thought the penalties were tougher than older respondents.</p> <table border="1"> <thead> <tr> <th></th> <th>Vic Pop (%)</th> <th>18-25 yrs (%)</th> </tr> </thead> <tbody> <tr> <td colspan="3">First hoon offence</td> </tr> <tr> <td>Too tough</td> <td>3</td> <td>4</td> </tr> <tr> <td>About right</td> <td>38</td> <td>58</td> </tr> <tr> <td>Not tough enough</td> <td>60</td> <td>38</td> </tr> <tr> <td colspan="3">Second hoon offence</td> </tr> <tr> <td>Too tough</td> <td>5</td> <td>7</td> </tr> <tr> <td>About right</td> <td>44</td> <td>54</td> </tr> <tr> <td>Not tough enough</td> <td>51</td> <td>38</td> </tr> <tr> <td colspan="3">Third hoon offence</td> </tr> <tr> <td>Too tough</td> <td>16</td> <td>22</td> </tr> <tr> <td>About right</td> <td>69</td> <td>69</td> </tr> <tr> <td>Not tough enough</td> <td>14</td> <td>8</td> </tr> </tbody> </table>		Vic Pop (%)	18-25 yrs (%)	First hoon offence			Too tough	3	4	About right	38	58	Not tough enough	60	38	Second hoon offence			Too tough	5	7	About right	44	54	Not tough enough	51	38	Third hoon offence			Too tough	16	22	About right	69	69	Not tough enough	14	8	<p>-2 focus groups were initially conducted.</p> <p>-628 participants were surveyed via telephone with quantitative items.</p> <p>-Opinions were gathered regarding:</p> <p>-- vehicle impoundment for hoon and drink drivers</p> <p>-- Victorian demerit point system,</p> <p>--use of intelligent speed adaptation (ISA)</p> <p>--night driving restrictions for probationary drivers in their first year of driving.</p>	Victoria	“high risk road users and behaviours”	2
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About right	69	69																																											
Not tough enough	14	8																																											
(LEAL ET AL., 2009)	Conduct a focus group with self-reported hoon drivers about vehicle impoundment laws	<p>-Generally, participants seemed okay with the 48 hr impoundment if they were ‘doing something stupid’, though some still thought that was already too harsh. For the third strike vehicle forfeiture, participants said that they would rather run from police and risk their lives than give up their car given the money spent and attachment to their car.</p> <p>-Deterrence theory not enough to explain responses.</p> <p>-Frequency that participants avoided police supports expanded deterrence theory.</p>	<p>-22 drivers who self-reported engaging in hooning behaviours participated in the focus groups.</p> <p>-Snowball method used for recruitment.</p> <p>-3 focus groups conducted in SEQ and 1 focus group conducted in regional area. Groups were made up of participants in the same friendship group.</p> <p>-Participants filled out individual questionnaires and were asked focus group questions based on expanded deterrence theory (Stafford & Warr, 1993)</p>	Queensland	<p>““hooning”related driving behaviours, which in Australia and New Zealand includes illegal street racing and driving a vehicle in a way that causes unnecessary noise and smoke, such as burn outs and other types of skids.” (p1)</p> <p>“Queensland’s “anti-hooning” legislation (Police Powers and Responsibilities Act and Another Act Amendment Act 2002): dangerous operation of a motor vehicle; careless driving of a motor vehicle; racing and speed trials on roads; and wilfully starting a vehicle, or driving a vehicle, in a</p>	n/a																																							

REFERENCE	OBJECTIVE	INTERVENTIONS	METHODS AND RESULTS	COUNTRY/ JURISDICTION	HOONING BEHAVIOUR/ HOW HOONING IS DEFINED	RESEARCH QUALITY RATING
(PERRY & MCGILLIAN, 2008)	Provide overview of Victoria's Anti-Hoon Legislation (1 July 2006).	<ul style="list-style-type: none"> -Before the new legislation, Operation Stoker was an effort by Victoria police to catch and prosecute drivers for hoon behaviour over 18 days in June 2004. Operation Stoker resulted in 474 charges against 37 offenders, but did not seem to have an effect on hooning more broadly. -As of 24/7/2008, 5,225 vehicle impoundments had been made for the following hooning offenses: <ul style="list-style-type: none"> --2,380 vehicles for improper use, --2,059 for excessive speed, --45 for conduct engage in race/speed trial, --273 disqualified driving --131 Evade Police/Pursuit. -Reoffending rate is approximately 3%. 	-Not clear where crash data comes from, presumably police databases.	Victoria	<p>way that makes unnecessary noise or smoke." (p4)</p> <ul style="list-style-type: none"> •Improper Use of Motor Vehicle – defined as “intentional loss of traction to one or more wheels” • Careless Driving – with Improper Use • Manner Dangerous – with Improper Use • Engage in/Conduct Speed Trials Fail to Have Proper Control – with Improper Use • Undue Noise/Smoke – with Improper Use “ 	n/a
(GEE KEE ET AL., 2007)	Analyse predictive abilities of expanded deterrence theory (Stafford & Warr, 1993) and Aker's (1977) social learning theory for hooning behaviour.	<ul style="list-style-type: none"> -There may be a bias where people consider themselves better than average at avoiding punishment. -Higher perceived severity of punishments was associated with higher willingness to hoon in the future. But can't say if/what the causal relationship is there. 	<ul style="list-style-type: none"> -717 uni students participated in an online survey. -Survey included measures for extended deterrence theory (perceived risk of apprehension, swiftness of punishment, vicarious punishment avoidance, etc.) and measures for social learning theory (differential association, attitudes, rewards, punishments, and imitation). -Dependent variable was one item: “In the future, how willing would you be to engage in hooning behaviours?” with responses categorised into a likely/unlikely binary. 	Queensland	<p>“Hooning is a general term used to characterise a number of mostly illegal driving acts, including street racing, time trials, excessive speeding, burnouts, cruising, drifting and rolling road blocks.” (p1)</p> <p>Tabulated definition with reference to Folkman (2005) and Jarred (2002)</p>	2
(LEAL ET AL., 2007)	Review literature and compare anti-hooning interventions with other young driver safety interventions. Report offence data for young drivers and hooning behaviour in Queensland	<ul style="list-style-type: none"> -There are advantages of Queensland's graduated licensing scheme, including restrictions on night driving and peer-aged passengers. -In QLD, from the 2002 anti hooning laws to December 2006, 3,221 were impounded for 48 hours, 72 drivers offended again (30 day impoundment) and 4 drivers committed a third offence, and 1 a fourth. -Given that hooning is mostly done by young drivers, graduated licensing schemes and their limitations can be used to address hooning. 	Crash and offence data were analysed. Literature was reviewed, treating hooning as part of a broader young driver problem	Queensland	Behaviours associated with street racing.	2
(FOLKMAN, 2005)	Report prevalence statistics on hooning and what Queensland Police have done to reduce it.	<ul style="list-style-type: none"> -Queensland's Anti-Hoon legislation introduced in November 2002. -Traffic Response Group (TRG) or 'hoon squad' established in January 2002 with covert technology (including intelligence gathering from officers, the internet and informants, video-taping offences, etc.) to help detect hooning offenders. In 2005, TRG had 6 members (<0.1% of QPS force) but was responsible for 14.5% of impoundments. -TRG believe that hooning will return to pre-TRG levels if police presence is not maintained. -Rolling blockades on M1 stopped by TRG by videoing offenders and interviewing/prosecuting them afterwards. 	<ul style="list-style-type: none"> -Traffic Returns Analysis and Complaints System (TRACS) extended for hoon complaints and impoundment. TRACS database trialled in 1999/2000 and implemented state-wide afterwards. -Hooning and street racing related crashes underestimated in Queensland due to lack of dedicated information field in police reporting system. Even so, authors identified 12 serious crashes as a result of hooning from the database. 	Queensland	<p>Hooning behaviours include:</p> <ul style="list-style-type: none"> -Burnouts -Lapping -Street Racing -Road Blockades -Speed trial -Drifting -Parking up 	1

REFERENCE	OBJECTIVE	INTERVENTIONS	METHODS AND RESULTS	COUNTRY/ JURISDICTION	HOONING BEHAVIOUR/ HOW HOONING IS DEFINED	RESEARCH QUALITY RATING
		<p>-Operation YARD (young drivers at risk) education program is an hour-long session for high school students about vehicle control and risks, including physics, peer pressure, and consequences.</p> <p>-'Operation DRAG' in Warwick focussed on youths deemed at risk of street racing and hooning with a goal to reduce boredom and encourage alternative life goals. This included a partnership with TAFE and local drag race associations to create a program where youths were funded to do a mechanics course and work on cars to race safely on the raceway.</p>				
(ARMSTRONG & STEINHARDT, 2006)	Explore perceptions and experiences of street racing and hoon culture.	<p>"In the last two years since the introduction of Queensland's 'anti-hoon' legislation, over 1500 vehicles have been impounded and over 4100 disturbance complaints registered."</p> <p>-Focus group's points:</p> <p>--Vehicle modification law enforcement seems inconsistent and particularly targets younger drivers and are set up near legal and charity car events. Apparently difficult to know exactly what is legal or not, for both enthusiasts and police it seems.</p> <p>--Police attitudes seem to push members of the car enthusiast community away from formal and legal events. Participants suggest that police involvement should only be when people are 'doing something wrong' rather than defecting cars.</p> <p>--Media vilification of car enthusiasts attributed to rifts between police and the general community, and car enthusiasts.</p> <p>--Track racing is hugely expensive and not seen as a viable legal alternative to street racing for many. Though most participants suggested that subsidising track racing or drifting events would reduce hooning, especially if defect stations are not set up at exit.</p> <p>--Participants said that vehicle forfeiture is NOT a badge of honour, and is too harsh.</p>	<p>-Focus groups, e-mail responses, and message board feedback were used to examine young people's experiences and perceptions of hooning behaviour and new legislation.</p> <p>-For 4 focus groups, 14 presumably Brisbane-based participants were recruited through car enthusiast websites.</p> <p>-Queensland Transport WebCrash2 database accessed (1999-2004). Crashes with drivers aged between 12 – 24 were searched for hooning, racing, burnout and donut related crashes and 169 crashes were obtained.</p>	Queensland	"Street racing can take the form of spontaneous one-to-one racing or highly organised events, while "hooning" generally refers to activities such as burnouts or excessive acceleration."	2
(NEW SOUTH WALES. PARLIAMENT. JOINT STANDING COMMITTEE ON ROAD SAFETY, 1997)	STAYSAFE inquiry into the effectiveness of NSW's Traffic Amendment (Street and Illegal Drag Racing) Act 1996	<p>- NSW Traffic Amendment (Street and Illegal Drag Racing) Act 1996 reported to have successfully broken up regular congregations of car enthusiasts who engaged in illegal activities like burnout.</p> <p>-This act gave police the power to confiscate vehicles for engaging in illegal activity.</p> <p>-Police had no complaints about the new act. Only amendment was clearly define the time period after an offence when police can fine or confiscate a vehicle.</p>	- STAYSAFE inquiry into the effectiveness of NSW's Traffic Amendment (Street and Illegal Drag Racing) Act 1996	NSW	-Drag racing and related behaviours, including burnouts.	n/a
(LEIGH, 1996)	Understand motivations of street racers in Australia	<p>-Defect notices main means of control (in 1996), and if there are many defect notices one weekend, the next weekends attendance would be lower. Defecting seemed almost entirely at the discretion of police, with reported cases of new and unmodified cars being defected.</p> <p>-The author proposes that more legal street racing events and venues would reduce illegal street racing, though there will still be some appeal to illegal street racing because of its illegality.</p>	<p>-Interviews with street racers and attending illegal street races in Sydney.</p> <p>-Also interviewed police, legal drag racers, and others interested in street racing.</p>	Australia, Sydney	Street racing, typically quarter mile drag races in industrial areas, attended after an initial meet up (typically at a McDonalds) to decide who will race and where.	n/a

Appendix 3 – Literature concerning hoon behaviour interventions implemented in international jurisdictions

Table A3. Literature concerning hoon behaviour interventions implemented in international jurisdictions

REFERENCE	OBJECTIVE	INTERVENTIONS	METHODS AND RESULTS	COUNTRY/ JURISDICTION	HOONING BEHAVIOUR/ HOW HOONING IS DEFINED	RESEARCH QUALITY RATING
(HALL, 2021)	Argue that police should enforce traffic laws rather than unarmed officers/ automated cameras.	-“Automated enforcement systems cannot act on intelligence, go to car meet-ups, and prevent drag racing ahead of time.” p2	-Opinion piece and review.	USA, New York	n/a	n/a
(SIEV & KLIGER, 2021)	Test effectiveness of speed display signs spaced 2km apart	-When the first speed display sign was active, driver’s going extreme speeds (+30% of limit) decreased from 50% to 32%.	-Two speed display signs were placed 2km apart on a 70 km/h road. Conditions were first sign active and inactive.	Israel	Extreme speeds defined as 30% above speed limit.	3
(HØYE, 2020)	Investigate speed and impaired driving crash fatalities	-Excessive speeding and drunk drivers less likely to respond to countermeasures relying on voluntary behaviour changes or classical enforcement. Authors recommend intelligent speed adaptation, impoundment, or alcolocks to restrict high risk behaviours.	-1,591 crashes involving 1,949 cars between 2005 and 2015 were analysed	Norway	Excessive speeding defined as 20/30 km/h over the limit if limit under/over 60km/h respectively.	2
(MOHAMAD ET AL., 2019)	Overview of GENIUS Remaja youth wellness camp for Malaysian young motorcycle street racers (mat rempit)	-At risk youth were taken on multi day camps that were focused on self-development, emotional regulation, self-empowerment, and youth-to-youth community activities. -Anecdotally, the youths likes the camp and it changed their attitudes.	-Unknown number of participants and no clear formal evaluation methods. -Participant quotes presented as evidence for effectiveness.	Malaysia	Mat Rempit, young illegal motorcycle racers	1
(GARGOUM & EL-BASYOUNY, 2018)	Analyse crash data after new Canadian extreme speeding laws that include vehicle impoundment	-Legislative changes for extreme speeding were associated with drops in fatal crashes. -In Ontario, legislative changes resulted in a post-intervention decrease by 11 fatal collisions (18.3% drop) compared with pre-intervention period. Reduction of around 97 injury crashes was not significant in Ontario. -In British Columbia, excessive speeding policy was associated with an statistically significant 22% drop in fatal collisions. However the mean number of crashes increased, but the Impaired Driving Law which was implemented at the same time as British Columbia’s Excessive Speeding law was associated with a drop in injury collisions. However when the Impaired Driving Law was decreased in November 2011, there was a slight increase in injury collisions. - In Quebec, Extreme Speeding Law was at the same time as new Distracted Driving Law. After both laws were enacted, there was a non-significant trending decrease in fatal crashes of 5.5%. Injury crashes were significantly decreased after the new laws, with a decrease of 325 crashes compared to pre-exposure.	-Box-Jenkins methodology, involving ARIMA models for time series data.	Canada	Excessive speeding defined as 40 km/h over speed limit (with some variation between provinces)	5
(HUGHES, 2018)	PhD thesis, case study of street racing club members’ experiences	-Participants reported to only ever be fearful of damaging their cars, rather than risk of injury or apprehension by law enforcement. Reported being careful to avoid police by racing on certain roads and only with people that they know. -Author suggests that deterrence factors like fines, impoundment and imprisonment work outside of the US, but not in the US city studied.	-8 participants were interviewed and observed in the field. -Thematic analysis conducted .	USA, ‘Southwestern City’	n/a – focus on street racing	N/A

REFERENCE	OBJECTIVE	INTERVENTIONS	METHODS AND RESULTS	COUNTRY/ JURISDICTION	HOONING BEHAVIOUR/ HOW HOONING IS DEFINED	RESEARCH QUALITY RATING
(MAKEY, TRANSPORTATION ASSOCIATION OF CANADA, 2015)	Present two cases of 'geometric' road design being used to reduce speeding	-Typically, roads have been designed to be 'forgiving' with a higher design speed than posting speed, but that also often results in higher operating speed. 'Geometric design', including islands and two-way turning middles lanes, reduced average speeds. Author proposes reduced need for police. -However, 'delinquent drivers' are less likely to respond to these interventions because their speeding behaviour is intentional, so authors propose that police presence still requires for them.	-Added islands or two-way middle turning lanes to slow down drivers -Surveyed speeds on roads. Device not specified	Canada	Delinquent drivers only mentioned at the end as an example of when road design probably wouldn't help and you need police presence.	n/a
(LUMSDEN, 2016)	Explore Aberdeen, Scotland's attempts to exclude 'boy racers' from public spaces and their responses to it.	-'regeneration of urban space' from the 1990s onwards included various developments like a leisure park, shopping centre, and adding more streetlights and CCTV. This resulted in an increasingly middle-class residential demographic who saw the 'boy racers' as a nuisance and increased police activity in the area. Though this may have reduced the dominance of car enthusiast culture in the area, it is described not so much as an intervention as a cause of 'zones of contention' between classes and cultures in urban spaces. -'anti-social behaviour legislation' and frequent meetings between police and boy racer gatekeepers fostered self-policing in the boy racer community (according to a police officer) -Also CCTV, police patrols, speed checks. -This was a means of 'reclaiming public space in line with capitalist consumer interests' according to authors.	-Analysed data from ethnographic research with boy racers, including 8 semi-structured interviews. -Applied Lefebvre's (1991) Marxist analysis of space and 'conceptual triad'	Scotland, Aberdeen	Boy racers, in Aberdeen specifically as 'Bouley Bashers' are car enthusiasts. This paper describes their culture through a sociological lens rather than defining specific boy racer behaviours.	N/A
(LUMSDEN, 2015)	Apply Elias' ([1939] 1994) concepts of the civilizing process and technization to car modding culture and its regulation in Aberdeen, Scotland	-'techno-fixes' such as light and sound meters are used to regulate modded cars with the justification that they are unsafe to drive.	-Data gathered from ethnographic research with boy racers in Aberdeen, Scotland from September 2006 to August 2007 (same data as reported in (Lumsden, 2016)). -150 hours were spent in the field. -Semi-structured interviews conducted with boy racer groups and with outside groups. -Content analysis of media reports.	Scotland, Aberdeen	Focus on car modifications	n/a
(YILDIRIM-YENIER ET AL., 2015)	Explore associations between attitudes towards new street racing and stunt driving laws in Ontario, appraisals of risk, and general attitudes and behaviour towards street racing and stunt driving.	-Participants who disagreed with Ontario's new Street Racers, Stunt and Aggressive Drivers Legislation (both the new offences and the new penalties) were more likely to have more positive attitudes towards street racing and stunt driving (eg. <i>strongly agree</i> to "I think it's OK to race other cars as long as you don't get caught"), and more likely to have reported ordinary traffic violations (speeding). Participants who disagreed with just the new offences were also more likely to have reported aggressive driving violations (swearing, honking etc.) How comparatively risky participants thought stunt driving was NOT related to self-reported traffic violations, attitudes towards the acceptability of street racing, or attitudes towards the new law.	-366 participants recruited from car club and racing websites in Ontario. -Questionnaire with 7-point Likert-type questions about attitudes towards new penalties, attitudes towards new offences, general attitudes towards street racing and stunt driving, and other driving measures like crashes, aggressive behaviour, and traffic citations.	Canada, Ontario	Street racing and stunt driving	2
(MEIRAMBAYEVA, VINGILIS, ZOU, ET AL., 2014)	Evaluate impact of Ontario's street racing and stunt driving laws on extreme speeding.	-A significant intervention effect on reduced extreme speeding convictions after the 2007 Ontario laws was found for males, but not females.	-24,401 drivers had license suspensions for violating new street racing legislation were carried out	Canada, Ontario	Street racing and stunt driving, similar to as in Australian anti-hooning laws.	5

REFERENCE	OBJECTIVE	INTERVENTIONS	METHODS AND RESULTS	COUNTRY/ JURISDICTION	HOONING BEHAVIOUR/ HOW HOONING IS DEFINED	RESEARCH QUALITY RATING
		-Because males are more likely to engage in street racing and stunt driving, this is interpreted to mean that the new legislation was successful intervention for street racing and stunt driving.	between September 30 2007 and December 31 2011. -Interrupted time analysis with ARIMA modelling applied to monthly extreme speeding convictions from January 1 2004 to end of 2011.			
(LUMSDEN, 2014)	Explore effects of UK Anti-social behaviour legislation on boy racers and police.	-Anti-social behaviour legislation made illegal certain behaviours that had not previously been perceived as anti-social or defiant. -Selective enforcement, especially of vehicle modification laws, made it difficult for car enthusiasts who wanted to follow the law to know what is and is not illegal.	-Used data from PhD fieldwork also written up in Lumsden (2015 and 2016). Includes content analysis of media and semi-structured interviews with members of the boy racer community and police.	Aberdeen, Scotland	Boy racers. See other work by Lumsden for ethnographic details of the community.	N/A
(MEIRAMBAYEVA, VINGILIS, MCLEOD, ET AL., 2014)	Evaluate impact of 2007 Ontario laws on speeding related crash fatalities	-Introduction of the 2007 Ontario street racing and stunt driving laws were associated with a reduction of 58 fewer casualties per month, on average, among young male drivers (16-25 years old). -No difference for female drivers or 25+ year old male drivers, as expected.	-Speeding related crash data from between January 1 2002 and December 31 2010 obtained from MTO Accident Data System. -Used roadside suspension data as a process measure, and highway speed data as an intermediate outcome measure. Used non-speeding related casualties as a control. -Interrupted time series analysis with ARIMA modelling.	Canada, Ontario	Street racing and stunt driving, similar to as in Australian anti-hooning laws.	5
(LUMSDEN, 2013)	Explore how policing practice, legislation and technology has been used to attempt to regulate car enthusiasts	-Police decisions when enforcing driving law is influenced by a range of endogenous and exogenous factors. -Some behaviours that were not seen as anti-social by police (gatherings, somewhat loud cars) were seen as anti-social by the public, putting the police in a difficult situation. -Police engaged in a deeper tradition of community policing, including the balancing of limited resources. -Redesign of Beach Boulevard made street racing impossible, causing a shift from 'boy racers' to 'cruising' scenes	Another report from Karen Lumsden's PhD ethnographic work.	Scotland, Aberdeen	Anti-social driving defined fluidly	N/A
(VINGILIS, SEELEY, WIESENTHAL, MANN, ET AL., 2013)	Explore relationships between risky driving self-perceptions, street racing attitudes, perceptions of risk/seriousness of other driving behaviours, and attitudes towards Ontario's new laws, and self-reported risky driving.	-Participants who self-reported engaging in any stunt driving behaviours (as defined by Ontario law) were more likely to disagree with all new laws under Ontario's new Street Racers, Stunt and Aggressive Drivers Legislation, be thrill seeking drivers, have competitive attitudes towards driving, and have a positive attitude toward street racing.	-Same survey as in (Vingilis, Seeley, Wiesenthal, Wickens, et al., 2013), but this paper reports beliefs about seriousness of crash likelihoods and attitudes towards Ontario's new street racing law. -Also includes self-reported collisions, traffic offences and stunt driving.	Canada, Ontario	Street-racing and self-reported risky driving per the Risk-Taking Driving Scale	2
(VINGILIS & SMART, 2009)	Literature review of street racing, who and why, legal issues, and interventions.	-Authors described attempts to create safe racing premises (RaceLegal in San Diego) and create legislation and enforcement of it (eg. Ontario and Queensland). -Los Angeles and Queensland were examples of jurisdictions that had inspectors who look for vehicles that have been modified to	-Narrative review of street racing literature.	International	Street racing	N/A

REFERENCE	OBJECTIVE	INTERVENTIONS	METHODS AND RESULTS	COUNTRY/ JURISDICTION	HOONING BEHAVIOUR/ HOW HOONING IS DEFINED	RESEARCH QUALITY RATING
		<p>be too powerful or have illegal mufflers, and impound them (LA) or give notices (QLD). No evaluations have been done on this approach.</p> <p>-Authors suggest that future interventions may involve regulating powerful car sales and advertisement, but they not that this may not be popular with car manufacturers or buyers. Another proposed response is to pressure YouTube to remove videos of street racing, but that has not been done.</p> <p>-Apparently car crashes increased after Adelaide’s first Grand Prix and Melbourne’s formula one race.</p>				
(BEERE, 2007)	PhD thesis on youth car enthusiast culture, beyond the narrative of “boy racers” or “hoons”	<p>-‘Land Transport Unauthorised Street and Drag Racing Amendment Act 2003’ in New Zealand gave police the power to impound vehicles suspected of street racing or intentional loss of traction. However, it did not appear to reduce the activities that it made illegal. In the year before the bill was enacted (April 2003), there were 55 crashes (5 fatal) attributed to street racing and 21 non-fatal crashes attributed to wheelspins (burnouts). In the year after, there were 39 crashes (4 fatal) from racing and 19 crashes (1 fatal) from wheelspins. (Sunday Star Times, 12th September 2004)</p> <p>-Public opinion and law enforcement priorities shifted congregations from the CBD to a road in an industrial area of Hamilton called ‘Te Rapa Straight’ (or T’ Straight). This move also may have led to increased gathering sizes because of the facilities and space afforded by T’ Straight. Attempts to remove youth car culture enthusiasts from T’ Straight have been resisted.</p> <p>-The author argues that youth car culture is a valid cultural expression, and that the community and kinship observed is in stark contrast with the dominant cultural narrative and disproportionate scrutiny that this group has been subjected to.</p> <p>-The ‘T’ Straight’ scene has become more “socially advanced” in the last 20 years with commercial and charity events and formal club structures. The social connections observed within the group also seemed to mitigate dangerous driving. Although some illegal driving continued, particularly risky or conspicuous activity was looked down on by the community as potentially jeopardising the continuation of the scene.</p>	<p>-Detailed PhD thesis that details autoethnography, participant observation, interviews, and a literature review.</p> <p>-Youth car culture in Hamilton, New Zealand was the particular focus of analysis.</p>	New Zealand, Hamilton	One of the main purposes of this thesis is unpacking and complicating that question.	N/A
(WORRALL & TIBBETTS, 2006)	Explain decline in illegal street-racing related casualties in San Diego	<p>-Decrease in illegal street-racing casualties in Sand Diego can be attributed to a mix of:</p> <p>-San Diego passed a spectator ordinance so that those in attendance of an illegal street race can be arrested. They also passed a forfeiture ordinance. Regression analysis showed that forfeiture ordinance had the most pronounced effect.</p> <p>-highly publicised murder conviction for street racing related casualty.</p> <p>-increase in number of sanctioned racing events.</p>	<p>-Zero-inflated negative binomial regression models run with crash data.</p>	USA, California, San Diego	Street racing	5
(PECK & VOAS, 2002)	Explore why vehicle forfeiture laws seem to be enforced less than impoundment laws.	<p>-Impound laws were effective for reducing recidivism of driving without a license or with a suspended license after DUI.</p> <p>-Enforcing and prosecuting vehicle forfeiture for repeat offenders was perceived as too time-consuming or not a priority.</p>	<p>-17 interviews with police officers and district attorneys.</p> <p>-Discussed why forfeiture laws enforced less than impoundment.</p>	USA, California	Impoundment and forfeiture was the punishment for driving without a license or with a suspended license.	n/a

REFERENCE	OBJECTIVE	INTERVENTIONS	METHODS AND RESULTS	COUNTRY/ JURISDICTION	HOONING BEHAVIOUR/ HOW HOONING IS DEFINED	RESEARCH QUALITY RATING
(DEYOUNG, 2000)	Evaluate general deterrent effect of vehicle impoundment laws for driving while suspended on crashes.	<p>-Many drivers who had their car impounded did not come and collect it afterwards, possibly because the \$700 cost to collect the vehicle may be more expensive than the car is worth. This makes impoundment in those cases functionally the same as forfeiture.</p> <p>-Suggested that vehicle forfeiture for driving without a license may not have substantial effect above and beyond the already successful impoundment laws in Californian jurisdictions.</p> <p>-No clear evidence of a general deterrent effect of vehicle impoundment and forfeiture on crash rates for suspended and revoked drivers. Crashes in both groups continued to decline after impoundment and forfeiture laws, but drop for suspended/revoked drivers was only slightly larger than for general drivers who were not expected to be effected by the laws that targeted recidivism (13.6% decrease vs 8.3% decrease in crashes). However most of this effect attenuated after 4 months.</p> <p>-The lack of general deterrent effect may be due to the impoundment legislation not being widely known and communicated in the jurisdiction.</p>	<p>-Interrupted time series analysis of crash data (ARIMA), and simultaneous transfer function analysis.</p> <p>-Drivers with suspended/revoked licenses crash histories were analysed compared with validly licensed drivers as a control.</p>	USA, California	Drivers with a revoked or suspended license.	4
(DEYOUNG, 1999)	Evaluate specific deterrent effect of vehicle impoundment laws for driving while suspended, revoked or unlicensed on driving behaviour.	<p>-Drivers who had their vehicles impounded after first DWS/R/U had 23.8% fewer DWS/R/U convictions, 18.1% fewer traffic convictions and 24.7% fewer crashes compared with similar drivers who had not had their vehicles impounded.</p> <p>-Effects were stronger for repeat offenders.</p> <p>-Strong evidence for specific deterrent effect of impoundment.</p>	<p>-Compared drivers convicted of DWS/R/U in 1994 before impoundment law (n=6397) with those convicted in 1995 who were impounded (n=6327).</p> <p>-Evaluated traffic convictions, crashes and DWS/R/U rates.</p> <p>-1-year post-impoundment data obtained</p>	USA, California	Drivers with a suspended or revoked license or unlicensed (DWS/R/U).	5
(VOAS ET AL., 1998)	Compare vehicle immobilisation and vehicle impoundment laws in different Ohio counties.	<p>-Franklin County, Ohio introduced a vehicle immobilisation program that significantly reduced recidivism of driving while unlicensed both during and after the immobilisation period.</p> <p>-Similar results were found in Hamilton County, Ohio, with vehicle impoundment for driving with a suspended license.</p> <p>-Reduction in recidivism after impoundment may be due to deterrence or may be due to losing access to vehicle because some did not reclaim their vehicle after impoundment.</p>	<p>-Repeat driving while suspended and driving while intoxicated offences in Hamilton County were obtained from the Ohio driver record system.</p> <p>-Survival analysis used to test rated of recidivism.</p>	USA, Ohio	Impoundment and immobilisation for driving while suspended after a DUI.	4

Appendix 4 – Literature concerning motivations for and factors associated with hoon behaviours

Table A4. Literature concerning motivations for and factors associated with hoon behaviours

REFERENCE	OBJECTIVE	MOTIVATIONS AND ASSOCIATED FACTORS	METHODS	COUNTRY/ JURISDICTION	HOONING BEHAVIOUR/ HOW HOONING IS DEFINED	RESEARCH QUALITY RATING
(SIEV & KLIGER, 2021)	Test effectiveness of speed display signs spaced 2km apart	-Many drivers were speeding up to but below the point where fines were likely (11-20km/h over the limit is when Israeli police start giving fines).	-Two speed display signs were placed 2km apart on a 70 km/h road. Conditions were first sign active and inactive.	Israel	-Extreme speeds defined as 30% above speed limit.	3
(HALL, 2021)	Argue that police should enforce traffic laws rather than unarmed officers/ automated cameras.	-NYPD noticed a big increase in fraudulent plates being used through 2020 (5,247 fraudulent plates) -Fraudulent plates and traffic crime often linked to more serious crime (eg. cars theft for shootings)	-Opinion piece and review.	USA, New York	n/a	N/A
(SURETTE, 2020)	Analyse the “ghost riding the whip” copycat crime wave.	-Ghost riding (dancing on or next to moving car without driver) surged in 2006 reaching middle class popularity in 3 months. -Ghost riding attributed to rap music and social media.	-Examined google trends, rap songs, news media, and youtube videos. -Applied Gabriel Tarde’s ideas on crime imitation (1912).	USA, Florida	Technically ghost riding would be considered hooning Victoria and SA because it’s driving a vehicle without proper control.	N/A
(JAVID & AL-ROUSHDI, 2019)	Model various causes of driver speeding in Oman	-Authors found many factors linked to self reported speeding, including being a young man.	-301 participants surveyed. -Factor analysis and SEM based on Norm-Activation Model theory.	Oman	n/a	2
(MUMSHAD & ASHRAF, 2019)	Student letter to the editor about illegal motorcycle racing in Pakistan	-Motorcycle racing gaining popularity because of: --social media attention --monetary rewards attracting low-income racers.	-Letter to the editor. -No primary data collected	Pakistan	n/a	N/A
(JEOLÁS, 2018)	Ethnographic study of illegal motorcycle and street racers.	“The racers are young individuals from lower-income classes, who respond to social impotence, which deprives them of economic (and social) capital, by using technological capital” (abstract)	-Ethnographic study, considering participants as responding to biopolitics or forms of life control.	Brazil	focus on street racing	N/A
(KAR ET AL., 2018)	Analysis of survey on adolescent street race, risky driving and crash risk.	-13% of sample reported driving in a street race. -Driving in a street race was significantly associated with other risky driving behaviours, but not independently associated with crashes. -Young Black, Latino and mixed race low-SES drivers most likely to engage in street racing.	-NEXT Generation Health Study (N=2,395). Risky driving, street racing, self-reported crash and demographic variables for adolescents obtained from 2009-2010. -Binomial logistic regression used to analyse data.	USA	focus on street racing	2
(HUGHES, 2018)	PhD thesis, case study of street racing club members’ experiences	-Emerging themes included “growing up with cars, utilitarianism and pursuit of happiness, adrenaline, love and belonging needs, drive to self-actualize, esteem needs, and stereotypes of females” (from abstract) -All members engaged in some pro-social community activities with their clubs like food drives, fundraisers, movement awareness, and homeless assistance.	-8 participants were interviewed and observed in the field. -Thematic analysis conducted .	USA, ‘Southwestern City’	focus on street racing	N/A
(MIRMAN, 2018)	Editorial about individual- and social-level understandings of agency in adolescent vehicle crash risks.	-Passengers who are risk-accepting increase crash risk in young drivers -Individual-level theories from research with non-crashers create a gap between theory and application.	-Review of literature and opinion on methods used and consequent theories and applications. -References other work by this author that may be relevant for this report.	International, USA, Alabama	focus is on street racing	N/A

REFERENCE	OBJECTIVE	MOTIVATIONS AND ASSOCIATED FACTORS	METHODS	COUNTRY/ JURISDICTION	HOONING BEHAVIOUR/ HOW HOONING IS DEFINED	RESEARCH QUALITY RATING
(VINGILIS ET AL., 2017)	Literature review of YouTube and risky driving videos.	-Risky driving is mostly done by young men. -YouTube's biggest audience is young men. -Risky driving behaviours like "sidewalk skiing" and "ghost riding the whip" have become popular online trends, resulting in modelling behaviour.	-Systematic search of academic databases for "YouTube AND (driving OR speeding OR racing)" yielded nothing. -Reported the views and subscriber counts to the top 20 car channels.	International	Risky driving	N/A
(WICKENS ET AL., 2017)	Analyse relationship between self-reported street racing and crash experience	-Self-reported street racing behaviour was associated with a 5.23 x increase in odds of being in a crash in the last 12 months, even after controlling for demographic (age, sex, income, education, region, and marital status), driving exposure, and driving after use of alcohol and cannabis measures. -Street racing more prevalent among males aged 18-25.	-11,263 respondents to CAMH monitor (2009-2014) were surveyed. -0.9% of respondents reported to have driven in a street race in the last 12 months. -Hierarchical-entry binary logistic regression was used to analyse the data.	Canada, Ontario	"By 'street racing' we mean any type of race on public roads. This could include an organized race between two or more drivers, or a driver challenging other drivers on a public road or a single driver racing to see how fast he or she can go."	2
(RAMISETTY-MIKLER & ALMAKADMA, 2016)	Survey Saudi Arabian school students' perceptions and attitudes towards risky driving.	-40% of surveyed students reported engaging in Tafheet (risky driving behaviour). 70% of those who said Tafheet was cool or a talent engaged in the behaviour. -Tafheet 2.7 x more likely in students who are willing to engage in dangerous behaviours, think there's no harm in not wearing seat belts, or use mobile phones while driving. -12% of respondents said that Tafheet is a violent act, and 46% indicated it should be prohibited.	-799 male students (7-12 th grade) participated in survey. 99% were of Islamic faith, 71% Saudi, 23% from other Arab nations, and 6% from other cultures. -Logistic regression for multivariable analysis, showing adjusted odds ratios.	Saudi Arabia, Riyadh	Tafheet or Hajwalah is Arabic for "Arab Drift", which is like normal loss of traction drifting but with fine sand. Supposedly emerged in the 1970s.	2
(AMIT ET AL., 2016)	Find demographic characteristics of motorcycle street racers (mat rempit) in Malaysia	-Impulsivity had a low positive correlation with mild street racing offence. -Strong correlation between impulsivity and global sensation. -Typically, mat rempit are school leavers, still in school/college, or unemployed/unskilled workers. -Illegally modified motorcycles often ridden, and sometimes under influence of alcohol or drugs. -Mat rempit associated with other criminal behaviours (see references on p97)	-197 illegal motorcycle racers (14-26 years old) participated through the Centre for Empowering Youth (PERKASA). -All participants were Malay males. -Survey questions, including sensation seeking, were given. -Correlation analysis and one-way ANOVAs used to analyse data.	Malaysia	-Mat rempit are street racers in Malaysia.	2
(LUMSDEN, 2016)	Explore Aberdeen, Scotland's attempts to exclude 'boy racers' from public spaces and their responses to it.	-Started as 'Bouley Backers' in the 1960s and 70s. -Would travel to Aberdeen's Beach boulevard from all over Scotland. -Originally cars were older and dented but that changed when members brought newer and better cars. -Typically newer licensed and younger drivers seen as higher-risk in the boy racer community because they are not yet familiar with the group's informal code of conduct around risky and nuisance driving. -With regards to excessive noise, belief that people moving into the area should expect it. "if you bought a flat on Union Street you're not going to complain about there being too many drunks"	-Analysed data from ethnographic research with boy racers, including 8 semi-structured interviews. -Applied Lefebvre's (1991) Marxist analysis of space and 'conceptual triad'	Scotland, Aberdeen	Boy racers, in Aberdeen specifically as 'Bouley Bashers' are car enthusiasts. This paper describes their culture through a sociological lens rather than defining specific boy racer behaviours.	N/A
(YILDIRIM-YENIER ET AL., 2015)	Explore associations between attitudes towards new street racing and stunt driving laws in Ontario, appraisals of risk, and general	-Attitudes towards new street racing and stunt driving laws was negatively associated with ordinary violations (general speeding), which was in turn associated with traffic offence citations. -General attitudes positive attitudes towards street racing and stunt driving were also positively associated with both speeding and aggressive (honking and swearing) violations, which in turn predicted offence citations.	-366 participants recruited from car club and racing websites in Ontario. -Questionnaire with 7-point Likert-type questions about attitudes towards new penalties, attitudes towards new offences, general attitudes towards street racing and stunt driving, and	Canada, Ontario	Street racing and stunt driving	2

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	attitudes and behaviour towards street racing and stunt driving.	-The only factor associated with self-reported crashes was 'aggressive violations', but that was a weak and barely significant effect.	other driving measures like crashes, aggressive behaviour, and traffic citations.			
(LUMSDEN, 2015)	Apply Elias' ([1939] 1994) concepts of the civilizing process and technization to car modding culture and its regulation in Aberdeen, Scotland	-Car modding (modifying) is an integral component to boy racer community. -Young car modders are 'decivilizing' the automobile by moving away from the self-restraint, conformity and etiquette of driving norms that attempt to minimise violence and risk in driving situations. Attempts by law enforcement to control car modding is argued to be an attempt to recivilize the boy racer and control the desires and experiences of drivers. -Car mod regulation is challenged by the technical proficiency of the mechanics in the boy racer community, and the technical proficiency required to adequately regulate car mods. It has been further complicated by the confusion around what mods are and are not considered legal, especially by younger drivers. -Techno-fixes' such as light and sound meters have been one tool used to attempt to do this.	-Data gathered from ethnographic research with boy racers in Aberdeen, Scotland from September 2006 to August 2007 (same data as reported in (Lumsden, 2016)). -150 hours were spent in the field. -Semi-structured interviews conducted with boy racer groups and with outside groups. -Content analysis of media reports.	Scotland, Aberdeen	focus on car modifications	N/A
(IBRAHIM ET AL., 2015)	Examine relationship between personality, aggression and sensation seeking, and other illegal activities among illegal motorcycle street racers in Malaysia	-Large proportion of the sample of illegal motorcycle street racers also smoked (94.2%), were truants (66.7%), watched pornography (63.0%) and 'were involved with illegal abortion' (40.6%), fighting and bullying (33.3%) and gambling (31.9%). -Neuroticism and sensation seeking associated with physical aggression and anger.	-138 at-risk adolescents (14-26 years old) who had done illegal motorcycle street racing participated in the survey. -BFI, SSS-V, and BPAQ used to measure personality, sensation seeking and aggressiveness, respectively.	Malaysia	Illegal motorcycle street racing, including running roadblocks, driving on the wrong side of the road, and risky stunts.	2
(VOOGT ET AL., 2014)	Literature review of associations between age and characteristics of risky young drivers	[note: review paper, not primary source] -Young men more likely to engage in risky driving and hooning. -More likely with similar-age peers as passengers. -More likely with 'antisocial' peers and hoon driving related to other offences like drugs and petty theft. -Hoon drivers report two types of hoons, 'enthusiasts' and 'antisocial'. -Underestimate the risk of their own behaviour and believe they are unlikely to get caught (they're "smart").	-Literature review -Searched risky-, dangerous-, drink- and drunk- driving, hoon and speeding, and street- and drag- racing in psychology and sociology databases. -Search result had 2035 papers, 33 selected from screening.	Victoria (Deakin) but with general implications	Very broad definition: "For the purposes of this paper the terms 'risky', 'unsafe', 'hazardous' and 'dangerous driving' are used interchangeably to refer to any driving behaviour that is intentionally antisocial or has the potential to cause a traffic collision or road injury and is engaged in due to perceived positive outcomes for the driver." (p51)	N/A
(MEIRAMBAYEVA, VINGILIS, ZOU, ET AL., 2014)	Evaluate impact of Ontario's street racing and stunt driving laws on extreme speeding.	-Male drivers more likely to engage in street racing and stunt driving, which formed the basis of this study's hypothesis.	-24,401 drivers had license suspensions for violating new street racing legislation were carried out between September 30 2007 and December 31 2011. -Interrupted time analysis with ARIMA modelling applied to monthly extreme speeding convictions from January 1 2004 to end of 2011.	Canada, Ontario	Street racing and stunt driving, similar to as in Australian anti-hooning laws.	5
(MEIRAMBAYEVA, VINGILIS, MCLEOD, ET AL., 2014)	Evaluate impact of 2007 Ontario laws on	-Male drivers more likely to engage in street racing and stunt driving, which formed the basis of this study's hypothesis.	-Speeding related crash data from between January 1 2002 and December	Canada, Ontario	Street racing and stunt driving, similar to as in Australian anti-hooning laws.	5

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	speeding related crash fatalities		31 2010 obtained from MTO Accident Data System. -Used roadside suspension data as a process measure, and highway speed data as an intermediate outcome measure. Used non-speeding related casualties as a control. -Interrupted time series analysis with ARIMA modelling.			
(JOELSSON, 2014)	Understand approaches to risk-taking in young men who speed and drift.	-The term ragarre (greaser) in , originates from 1950s with American cars. Volvo greasers are the younger evolution who drive Volvos. -The greasers consider those who are unskilled, drunk, or lacking awareness of the limits of their competence as the most at risk of crashing. -Young men’s recounting of crashes or near misses lacked emotional content and contained humour, while young womens’ stories had more emotional content and less humour, indicating a more serious and ‘caring’ approach to safety.	-Contextualization used as an analytical tool to develop a situated concept of risk-taking among young men and women aged 15 to 19. -Ethnographic material collected in 2010 and 2011 in a peri-urban Swedish community. Includes 6 group interviews and 12 individual interviews (15 boys and 7 girls altogether).	Sweden	‘Volvo greasers’ who speed and drift	N/A
(VINGILIS ET AL., 2014)	Examine relationships between ADHD, other mental health problems, substance use, and driving including street racing.	-There were no statistically significant differences between those with or without ADHD symptoms on self-reported drink driving, smoking weed and driving, street racing, or collision involvement. -Self-reported collision involvement more likely with younger drivers who drive more kilometres a week (sequential regression) -Racing significantly associated with self-reported crashes. (chi-square tests). 9 respondents who raced in the past year (25.7%) also crashed in the past year, compared with 26 who raced and didn’t crash. 5.9% of respondents who didn’t race crashed in the last year.	4,014 Ontario residents participated in survey, 3,485 had a valid driver’s license, 3.22% had ADHD symptoms.	Canada, Ontario	Street racing	2
(VINGILIS, SEELEY, WIESENTHAL, WICKENS, ET AL., 2013)	Explore relationships between risky driving self-perceptions, street racing attitudes, street racing video games, and self-reported risky driving.	-20% of sample reported risk-taking driving. -Risk-taking driving positively associated with more positive attitudes towards street racing and more frequent playing of “drive’em up” videogames. Driver Thrill Seeking Scale and “circuit” video games not associated with self-reported risk-taking driving.	-503 participants were recruited from car and race club websites/ forums. -Driver Thrill Seeking and Competitive Attitude Toward Driving, and Risk-Taking Driving Scale scales were used. -Video games divided into “drive ‘em up” (eg. GTA, burnout) and “circuit” (eg. Gran Turismo) categories.	Canada, Ontario	Street-racing and self-reported risky driving per the Risk-Taking Driving Scale	2
(VINGILIS, SEELEY, WIESENTHAL, MANN, ET AL., 2013)	Explore relationships between risky driving self-perceptions, street racing attitudes, perceptions of risk/seriousness of other driving behaviours, and attitudes towards Ontario’s new laws, and self-reported risky driving.	-Stunt drivers more likely to be young, less concerned about excessive speeding and street racing, and had more positive attitudes toward street racing and stunt driving. -Stunt drivers were also more likely to score higher on driver thrill seeking, competitive attitude toward driving and risky driving scales. -Stunt drivers less likely to report red light running, phone use, drowsy driving as serious issues. More likely to report elderly driving as serious issue. Less likely to report excessive speeders, young drivers and street racers as likely to crash.	-Same survey as in (Vingilis, Seeley, Wiesenthal, Wickens, et al., 2013), but this paper reports beliefs about seriousness of crash likelihoods and attitudes towards Ontario’s new street racing law. -Also includes self-reported collisions, traffic offences and stunt driving.	Canada, Ontario	Street-racing and self-reported risky driving per the Risk-Taking Driving Scale	2

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(SMART ET AL., 2012)	Letter to the editor reporting preliminary study linking between street racing and mental health.	-1.0% of respondents reported being involved in a street race in the past year. -Significantly more likely to be young men. -Respondents with fair or poor mental health 4x more likely to have street raced than those with good or excellent mental health.	-4,273 participants' data obtained from general population telephone survey (Centre for Addiction and Mental Health Monitor) from January 2009 to December 2010.	Canada, Ontario	Street racing	2
(WONG, 2012)	Identify factors associated with illegal motorcycle street racing and help-seeking intention.	-Intention to seek help was extremely low. -77.9% responded that they would solve the problem themselves. -75.5% thought that illegal street racing was no big deal and they would grow out of it in time.	-2,022 Mat Rempit completed a survey.	Malaysia	Mat rempit illegal motorcycle street racers.	2
(FISCHER ET AL., 2012)	Meta-analysis of studies on risk glorification in media.	-Risk glorifying media have a causal force on risky behaviour, active participation has a stronger effect than passive participation. -Several psychological mechanisms are identified including priming of risk-related constructs, effects of risk-positive situational heuristic cues, perceived social norms, personal risk habituation, and changes in self-concept.	-Meta-analysis of studies on risk glorifying media.	International	Street racing included as one of many examples of risky behaviour in media, so is 'ghost riding the whip'.	N/A
(NEWITT, 2012)	Report on operation to stop hoon clubs, written by police	-Unlike other gangs, hoon club members were often affiliated with multiple clubs. -Car cruises planned for late at night at times deliberately set to avoid police.	-Report by a Detective Inspector summarising police operation.	South Australia	"Hooning activities generally involve 'misuse of a motor vehicle' as defined by the Road Traffic Act (SA) and include behaviours such as driving at excessive speed, 'street racing', wheel spinning, burnouts, noise generation and disturbance, and causing damage to road surfaces." (p42)	N/A
(VINGILIS ET AL., 2011)	Identify prevalence and correlates of street racing in high school students in Ontario.	- 1 in 5 (20.4%) licensed high schoolers in grades 11 and 12 reported street racing in the last 12 months. -Male students more likely to engage in street racing than female. Students in grade 11 more likely to engage in street racing than students in grade 12. -Students who self-reported property and drug delinquencies were more likely to engage in street racing.	-3,053 students (9-th to 12-th grade) participated in the 2009 Ontario Student Drug Use and Health Survey (OSDUHS). Logistic regression analysis conducted with year 11 and 12 students.	Canada, Ontario	Street racing	2
(SMART ET AL., 2011)	Report preliminary results for alcohol and cannabis use in street racing study	-1.0% of adult respondents self-reported street racing. -Street racing associated with alcohol problems, heavy drinking, cannabis use, and drink driving. -Of the 32 respondents who reported street racing, 25 were male, 12 had alcohol problems, 10 drank heavily, 10 had drunk and drove, and 13 has done cannabis.	-4,273 adults' data were obtained from the Centre for Association and Mental Health Monitor telephone survey (2009-2010).	Canada, Ontario	Street racing	2
(WONG, 2011)	Explore associations between socio-demographic variables and risk behaviour including street racing in Malaysia	-50.1% of street racing sample also engaged in stunt riding. -35.8% also drank alcohol while racing. -78.3% smoked cigarettes. -risk -Frequency of stunt riding and street racing associated with having lower highest education. -Frequency of street racing and stunt driving higher with lower household incomes, parental education, and less strict parents. -Masculinity scores positively associated with frequency of stunt driving.	-2,022 participants who had been street racing (mat rempit) completed a survey. -Mean time spent street racing was 2.65 years. -Logistic regression conducted on survey results.	Malaysia	Illegal motorcycle street racing	2

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(WARREN & GIBSON, 2011)	Reframe discussions of custom-car culture in Woollongong	-Custom-car culture, being predominantly working class or blue-collar, is not recognised as contributing to alternate forms of creativity to civic, economic and social life.	-Responsive ethnographic methods in Woollongong. Car enthusiasts were contacted through personal networks and car clubs.	Australia, Woollongong	'Hooning' is considered a moral panic, a tool to alienate car enthusiasts from the community.	N/A
(CONSTANTINOU ET AL., 2011)	Identify personality correlated with risky and aggressive driving in young adults	-DBQ score and ordinary violations were associated with self-reported crashes. -Young men were, again, most likely to report crashes and deliberate offences. -Mistakes and ordinary violations were associated with crashes. -Personality was a distal factor that did not correlate directly with driving outcomes. -Impulsivity and Sensation seeking were correlated with driver behaviour questionnaire. -Sensitivity to reward, nonplanning and disinhibition were predictors of driver behaviour in the SEM	-352 participants were recruited through college students, national guard, and young drivers in the general community. -Questionnaire included driver behaviour (DBQ), sensitivity to punishment and reward, sensation seeking, and impulsivity. -Correlations and structural equation modelling run.	Cyprus	Driver behaviour questionnaire	2
(CLARK ET AL., 2011)	Explore effectiveness of vehicle impoundment legislation	-Hooning was mostly done on primary arterials (30%), then local roads (20%), secondary arterials (16%) and freeways (14%). 58% of hooning occurrences occurred between 11pm and 7am. -59% were alone in their cars at time of offence, 29% had 1 passenger, 12 % had two or more passengers. -When asked about usual hooning behaviour, 45% reported doing it alone, 22% reported only with others, and 33% reported usually hooning while both alone and with others. That being said, focus group suggested that hooning behaviours most often done in groups with each person in their own car. -8 participants had been driver in crashes, 3 of which were self-attributed to hooning. 9 were passenger in crashes, 6 of which attributed to hooning. -53% of participants reported hooning spontaneously, with 20% planning to hoon. Hooning spontaneity could compromise the effectiveness safe race track meets as an intervention. -Participants reported engaging in hoon behaviours for the buzz or thrill of it.	-Analysis of Victoria Police impoundment data. Most participants contacted from Impoundment Unit + snowball procedure. -Survey completed by 52 drivers whose vehicles had been impounded (50 male, 2 female, 16-46 years old with 83% younger than 28 years old) -Focus groups conducted with 21 respondents (18 male, 3 female) in two groups. -65% of respondents had 1 offence. 38% did 'loss of traction' resulting in impoundment, 37% were speeding 45-120 km/h over limit.	Victoria	Losing tyre traction, causing excessive smoke and noise. Maybe speeding > 45 km/h over limit(?)	2
(THAKE ET AL., 2011)	Find what personality factors (5-factor model) predict loss of traction hooning	-People who reported loss of traction behaviours had lower agreeableness (3.39 vs. 3.81) but still not very disagreeable. -No other personality factors were associated with the behaviour. -From the sample, 54 reported doing LOT even in the last month, 316 didn't.	-422 participants completed an online survey. -Participants recruited from QUT or TAFE in Queensland. -Participants reported the number of times in the last month that they did a LOT event (burnouts etc.) -Personality measure by NEO-PI-R. -Sequential logistic regression run with sex and age as controls.	Queensland	"Though often considered collectively, two different subsets of vehicle-centred hooning activities are evident [5]. One is mainly characterised by speed and racing activities, and the other by noise and 'loss of traction' events [6]."	2
(FISCHER ET AL., 2011)	Literature review of portrayals of risk-taking in the media and its effects	-Risk-glorifying media can increase risk-taking behaviour and change people's attitudes towards risk and risk-taking.	-Literature on the effects of media that glorifies risk taking were analysed, most of which has been published by the author Peter Fischer himself.	International	Risky driving and street racing	N/A
(PALK ET AL., 2011)	Characterise people most likely to hoon and examine	-Young male drivers most likely to engage in hoon behaviours, but still a sizeable proportion of female hoons (~25% of female respondents)	-717 participants completed a questionnaire.	Queensland	"The use of vehicles in an anti-social, 'loutish' and dangerous manner".	2

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	relationship between hooning frequency and self-reported crash involvement	<ul style="list-style-type: none"> -42.7% of respondents reported to have engaged in a hooning behaviour at least once in their life. 4% reporting hooning more than 50 times. 17.7% reported intentions to hoon again. -Highest hooning frequency in 20-24 year ages (20%), followed by 16-19 year (13%) -Most common hooning behaviour was racing or dragging (50.7%), followed by burnouts (47.2%). -10.4% of respondents (20.3% of those who had hooned at least once) reported being involved in a crash while hooning, and those who crashed were more likely to be male, had a speeding infringement, and engaged in street racing. 	<ul style="list-style-type: none"> -Participants were drivers in Queensland recruited with snowballing technique -Logistic regression conducted. -Participants reported frequency and intention to engage in future hooning by specific behaviour (hooning, cruising etc.) -Participants also reported if they have been involved in a crash while hooning. -Most participants were university students 		Questionnaire split hooning behaviours by: burnouts, donuts, drifting, racing or dragging, organised group racing, cruising and rolling road blocks	
(COLICCHIO & PASSOS, 2010)	Examine driving behaviour of medical students.	<ul style="list-style-type: none"> -From both 1997 and 2008 samples together, 59% drove after drinking alcohol, 21.5% of which had consumed large amounts of alcohol. -10.5% of respondents had participated in illegal street racing (12.5% of men, 3.4% of women). -19.2% of all respondents had been involved in a crash (42.9% of those who had been street racing had been involved in a crash, 31.1% who has drove while heavily intoxicated had been in a crash). -2008 sample only showed reduction in drinking alcohol before driving. 	<ul style="list-style-type: none"> -354 medical students at Universidade de São Paulo participated in the survey in 2008. -This was combined with a sample of 377 students from 1997. 	Brazil, São Paulo	Street racing and drink driving.	4
(LUMSDEN, 2010)	Explore gender and women in 'boy racer' culture, 'girl racers'.	<ul style="list-style-type: none"> -Women who wanted to be active participants as drivers were required to act like 'one of the boys' in how they dressed, drove, spoke and in their attitudes. -Other women apparently enter the space for the men, which can be annoying for the women who are serious about car modding. 	<ul style="list-style-type: none"> -Ethnographic data from Karen Lumsden in Aberdeen, Scotland during her PhD. -Connell's notions of hegemonic masculinity and emphasized femininity applied to the data. 	Scotland, Aberdeen	'boy racers', 'girl racers', the car modding scene in Aberdeen	N/A
(VINGILIS & SMART, 2009)	Literature review of street racing, who and why, legal issues, and interventions.	<ul style="list-style-type: none"> -Authors report that there is limited official statistics and research about street racing, partially due to inconsistent definitions of the behaviour or dedicated coding for street races in police databases. 	<ul style="list-style-type: none"> -Narrative review of street racing literature. 	International	Street racing	N/A
(LEAL ET AL., 2009)	Conduct a focus group with self-reported hoon drivers about vehicle impoundment laws	<ul style="list-style-type: none"> -Of the 22 participants, 18 were male, 4 were female, median age 22, range 19-45. -Groups use police scanners and mobile phones to communicate and avoid police. For example, by informing others how many police there are and if the police are planning to approach them. -Sometimes hoons are very attached to their cars and sometimes they hoon with cheap cars or cars that aren't theirs that are considered disposable. -Participants seemed to not want to endanger others and preferred areas that were less populated and during hours when they wouldn't disturb others. This seems to illustrate that hoon drivers really are not a homogenous group of people. -Hooning happens in groups so individual perceptions are affected by group perceptions and group dynamics. 	<ul style="list-style-type: none"> -22 drivers who self-reported engaging in hooning behaviours participated in the focus groups. -Snowball method used for recruitment. -3 focus groups conducted in SEQ and 1 focus group conducted in regional area. Groups were made up of participants in the same friendship group. -Participants filled out individual questionnaires and were asked focus group questions based on expanded deterrence theory (Stafford & Warr, 1993) 	Queensland	""hooning""related driving behaviours, which in Australia and New Zealand includes illegal street racing and driving a vehicle in a way that causes unnecessary noise and smoke, such as burn outs and other types of skids." (p1) "Queensland's "anti-hooning" legislation (Police Powers and Responsibilities Act and Another Act Amendment Act 2002): dangerous operation of a motor vehicle; careless driving of a motor vehicle; racing and speed trials on roads; and wilfully starting a vehicle, or driving a vehicle, in a way that makes unnecessary noise or smoke." (p4)	N/A

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(LUMSDEN, 2008)	Understand how car enthusiasts in Aberdeen responded to the moral panic about them	-Members of the car enthusiast community blamed the moral panic on the 'outsiders' who did behave antisocially. -Supposedly those who don't want to engage in unsafe behaviour have tried to talk to those who do race and speed, but they won't budge.	-More ethnographic research by Karen Lumsden in Aberdeen.	Aberdeen, Scotland	Car enthusiast community	N/A
(N. LEAL ET AL., 2007)	Review literature and compare anti-hooning interventions with other young driver safety interventions. Report offence data for young drivers and hooning behaviour in Queensland	-A sample of 1,038 Queensland drivers charged with hooning were analysed. 89.9% were Caucasian, 97.4% male, 76.4% under 25. Of the 62.9% with known occupations, 19.0% were unemployed, 8.1% mechanics, 7.7% labourers, and 6.7% students.	Crash and offence data were analysed. Literature was reviewed, treating hooning as part of a broader young driver problem	Queensland	Behaviours associated with street racing.	2
(GRAHAM & WHITE, 2007)	Describe the social and cultural nature of youth car culture and the moral panic of hooning	-Cites Fuller's (2007) point that many behaviours now considered illegal hooning are not disproportionately responsible for road crashes. -There is a rich culture in car enthusiasm with multiple complexities and definitions of dangerousness.	-Literature review	Australia	"The word "hoon" is a term commonly used in Australian culture to refer to young people, especially young men, who engage in what may be perceived as dangerous driving behaviour. It can also refer to those who constantly show off in their cars in public." p29	N/A
(GEE KEE, STEINHARDT, ET AL., 2007)	Analyse predictive abilities of expanded deterrence theory (Stafford & Warr, 1993) and Aker's (1977) social learning theory for hooning behaviour.	-Deterrence theory accounted for 43% of variance in willingness to hoon. Significant predictors specifically were Perceived Severity of Punishment, Punishment Avoidance and Knowledge of Punishment. -Social learning theory accounted for 66% of variance in willingness to hoon. Significant predictors were attitudes and rewards. -Combining the models explained 71% of the variance in willingness to hoon. Each model accounted for some unique variance. Social learning theory predicted 29% unique variance beyond deterrence theory. Deterrence theory, 6% unique variance. -Social learning theory predicted hooning behaviour better than deterrence theory, highlighting how the social nature of hooning behaviour should be a target of interventions.	-717 uni students participated in an online survey. -Survey included measures for extended deterrence theory (perceived risk of apprehension, swiftness of punishment, vicarious punishment avoidance, etc.) and measures for social learning theory (differential association, attitudes, rewards, punishments, and imitation). -Dependent variable was one item: "In the future, how willing would you be to engage in hooning behaviours?" with responses categorised into a likely/unlikely binary.	Queensland	"Hooning is a general term used to characterise a number of mostly illegal driving acts, including street racing, time trials, excessive speeding, burnouts, cruising, drifting and rolling road blocks." (p1) Tabulated definition with reference to Folkman (2005) and Jarred (2002)	2
(GEE KEE, PALK, ET AL., 2007)	Examine prevalence, associated characteristics, types of hooning behaviours and self-reported crash history.	-Drag racing was the most common among men which cruising was most common among women. Burnouts and Drifting were also popular, with donuts, organised group racing and rolling road blocks least common within the sample. -20% of respondents who had reported past hooning also reported being involved in a crash resulting directly from hooning. 8% of total sample has been involved in a hooning related crash. -26.8% of respondents who had been in a hooning related crash were willing to hoon in future. -Likelihood of reporting having crashed increased with frequency of self-reported hooning.	-Same survey as reported in Palk et al. (2007) but with a breakdown of type of self-reported hooning behaviour and frequency.	Australia, Queensland	"The use of vehicles in an antisocial, 'loutish' and dangerous manner"	2
(LEAL ET AL., 2007)	Analyse characteristics of	-Most hooning offences were for causing unnecessary noise of smoke (66.9%), followed by racing and speed trials on roads	-Review of literature.	Australia, Queensland	"Over recent years, the term "hooning" has been used to refer to antisocial	2

REFERENCE	OBJECTIVE	MOTIVATIONS AND ASSOCIATED FACTORS	METHODS	COUNTRY/ JURISDICTION	HOONING BEHAVIOUR/ HOW HOONING IS DEFINED	RESEARCH QUALITY RATING
	hooning offences in Queensland by offence type	(19.4%), dangerous operation of motor vehicle (17.0%) and careless driving (14.0%). -Typically on Thursday to Sunday. -Almost always (95.4%) on a street, 1.8% in shopping area. -Typical manufacturer of cars differed between street racing and excessive noise or smoke offences, and newer cars were more likely to be used for street racing.	-Vehicle impoundment data collected from QPS database		driving behaviours such as illegal street racing, "burn outs" ¹ , "donuts" ² , "drifting" ³ , unnecessary speed or acceleration, speed trials ⁴ and even "cruising" ⁵ page 2	
(ELLWANGER, 2007)	Model general strain theory with young drivers' 'traffic delinquency'	-General strain theory attributes the motivations of crime to structural forces or responses to events or conditions that cause stress or strain, including the loss of valued goals, the addition of negative stimulus, and dissonance between aspirations, expectations and achievements. -Overall, general strain theory model did fit the larger data set including speeding, aggressive driving and risk taking, though the association between environmental and traffic strain on risk taking (including self-reported racing) was weaker than with aggressive driving and speeding.	-Structural regression analysis on college student survey data. -Applied 'general strain theory' of crime to delinquent driving.	USA	One item in the 'risk taking' factor included street racing. No other of the over 60 items in survey were hooning related	2
(PALK ET AL., 2007)	Apply social learning theory and deterrent theory to self-reported hooning behaviour.	-Perceived severity of punishment and punishment avoidance were significantly related to self-reported willingness to hoon. -Attitudes towards and rewards gained from the behaviour predicted willingness to hoon. -Learning via social networks more strongly associated with hooning than threat of punishment.	-717 participants were recruited from undergraduate university recruitment pool.	Australia, Queensland	"irresponsible and dangerous activities in a public place undertaken in a motor vehicle or motorcycle such as burnouts, donuts, drifting, cruising or racing"	2
(FALCONER & KINGHAM, 2007)	Deconstruct the term 'boy racer' and explore the subculture in detail.	-The 'boy racer' subculture has diverse membership, attitudes and behaviours. -The subculture is linked to place, which other members of the community can feel threatened by. -Linked to other illegal activities like vandalism, drugs and intimidation/violence.	-Phenomenological ethnographic approach -Semi-structured interviews and observing activities.	New Zealand, Christchurch	'boy racer' subculture	N/A
(BEERE, 2007)	PhD thesis on youth car enthusiast culture, beyond the narrative of "boy racers" or "hoons"	-Young people involved with car culture in Hamilton had a code of conduct for when certain driving behaviours were and were not acceptable. -Each of the car clubs had code of ethics charters that where largely adhered to and encouraged especially by members over 30 years old. -There was a time and a place for certain behaviours, for example burnouts in industrial areas during working hours were seen as unacceptable, not because of the risk of getting caught, but because of its impact on others. These codes varied between clubs and individuals. -Author's impression is that there are now 5 times more women, and more members over 30 years old in car enthusiast groups than there were 20 years ago. -Some members seen as 'inauthentic' especially if they didn't modify their cars themselves, and are blamed for scene's poor image.	-Detailed PhD thesis that details autoethnography, participant observation, interviews, and a literature review. -Youth car culture in Hamilton, New Zealand was the particular focus of analysis.	New Zealand, Hamilton	One of the main purposes of this thesis is unpacking and complicating that question.	N/A
(FOLKMAN, 2005)	Report prevalence statistics on hooning and what Queensland	-In QLD, Sunshine Coast and Gold Coast are 'hoon capitals' with 56% of hoon vehicle impoundments and forfeitures occurring in those regions. By police district, Gold Coast has had most	-Traffic Returns Analysis and Complaints System (TRACS) extended for hoon complaints and impoundment. TRACS	Queensland	Hooning behaviours include: -Burnouts -Lapping	1

REFERENCE	OBJECTIVE	MOTIVATIONS AND ASSOCIATED FACTORS	METHODS	COUNTRY/ JURISDICTION	HOONING BEHAVIOUR/ HOW HOONING IS DEFINED	RESEARCH QUALITY RATING
	Police have done to reduce it.	impoundment, followed by Logan/ Bundaberg had highest reoffence rate. -‘South Eastern Region’ had the highest number of impoundments and highest number of hoon-related traffic complaints. -“whilst hoons are often stereotyped as young drivers, there are a number of other groups who engage in this activity such as wealthy Asian students, young women, and relatively wealthy middle-aged businessmen.”	database trialled in 1999/2000 and implemented state-wide afterwards. -Hooning and street racing related crashes underestimated in Queensland due to lack of dedicated information field in police reporting system. Even so, authors identified 12 serious crashes as a result of hooning from the database.		-Street Racing -Road Blockades -Speed trial -Drifting -Parking up	
(ARMSTRONG & STEINHARDT, 2006)	Explore perceptions and experiences of street racing and hoon culture.	-Young males aged between 16 and 25. -Transient behaviour that people seem to grow out of in a couple of years. -Some argue that street racers and hoons are mainstream citizen car enthusiasts, others argue that street racing subculture is associated with and develops criminal activity. -Most (78%) of 169 hooning related crashes were in 60 km/h and lower speed zones. 72% occurred between 5pm – 4am. -Focus group points: --noted increasing number of female drivers. --there are ‘go’ and ‘show’ cars, making a car both fast and pretty is expensive. --there are enthusiasts and hoons, some of whom have the “dickhead element” (~10% of those who show up on a particular night). The ‘hoons’ are often (but not always) younger and mature into responsible members of the scene. --Participants were unanimously against drink driving and were very critical of those in the scene who do drink and drive.	-Focus groups, e-mail responses, and message board feedback were used to examine young people’s experiences and perceptions of hooning behaviour and new legislation. -For 4 focus groups, 14 presumably Brisbane-based participants were recruited through car enthusiast websites. -Queensland Transport WebCrash2 database accessed (1999-2004). Crashes with drivers aged between 12 – 24 were searched for hooning, racing, burnout and donut related crashes and 169 crashes were obtained.	Queensland	“Street racing can take the form of spontaneous one-to-one racing or highly organised events, while “hooning” generally refers to activities such as burnouts or excessive acceleration.”	2
(KNIGHT ET AL., 2004)	Measure prevalence of street racing related fatal crashes in USA.	-315 (0.21%) of fatal crashes involved street racing, resulting in 399 fatalities. -Street racing fatal crashes more likely to be on urban roadways and while >65 mph. -Street racers most likely to be male teenagers.	-NHTSA Fatality Analysis Reporting System data (1998-2001) was analysed. -149,568 fatal crashes analysed.	USA	Street racing	2
(WARN ET AL., 2004)	Explore connections between sensation seeking, interest in motor sport, risky driving and street racing.	-Interest in motor sport had a direct influence on street racing, but its influence on risky driving behaviour was through an effect on attitude toward speeding. -Street racing group had high levels of sensation seeking and high levels of involvement in motor sport.	-Young male drivers in high school, college or university in Christchurch were surveyed.	New Zealand, Christchurch	Street racing and risky driving.	2
(VAARANEN, 2004)	Explore the emotional experiences of working class street racers in Helsinki	-Street racing mostly involves working-class kids who race to escape stunted ambition and feelings of injustice in their daily lives. Provides identity, camaraderie and subcultural careers. They lean in to exclusion.	-Ethnographic fieldwork with 18-24 year old male street racers in Helsinki.	Finland, Helsinki	Street racing, kortteliralli	N/A
(SARKAR & ANDREAS, 2004)	Measure prevalence of risky driving behaviours in teenagers.	-Those who had been exposed to risky driving were more accepting of risky driving behaviours. -55% of students and 43% of traffic violators reported engaging in risky driving behaviours	-1,430 teenage student drivers and 880 teenage traffic violators were surveyed.	USA, California	Risky driving included drink driving, drag racing and reckless driving.	2
(VAARANEN & WIELOCH, 2002)	Cultural study of Helsinki’s street racers.	-Kortteliralli are often blue collar, anti-education and nationalistic, not learning English or travelling internationally for car parts. -Members card and friends are their freedoms.	-Uses Birmingham Center of Contemporary Cultural Studies	Finland, Helsinki	Street racing, kortteliralli	N/A

REFERENCE	OBJECTIVE	MOTIVATIONS AND ASSOCIATED FACTORS	METHODS	COUNTRY/ JURISDICTION	HOONING BEHAVIOUR/ HOW HOONING IS DEFINED	RESEARCH QUALITY RATING
			approach to the study of subcultures to street racing in Helsinki.			

Appendix 5 – Literature concerning the impact of COVID-19 on hoon behaviours

Table A5. Literature concerning the impact of COVID-19 on hoon behaviours

REFERENCE	OBJECTIVE	MOTIVATIONS AND ASSOCIATED FACTORS	METHODS	COUNTRY/ JURISDICTION	HOONING BEHAVIOUR/ HOW HOONING IS DEFINED	RESEARCH QUALITY RATING
(WOODS-FRY ET AL., 2021)	Poll road safety behaviours during COVID	-‘Stunt driving’ increased during covid-19 at a rate of -40.1% increase in Ontario -200% increase in Toronto (secondary references from intro) -During Covid19, some there was a division where the groups of respondents who reported being more likely and the group less likely to speed above 20km/h over limit grew (some more cautious, others more risky)	-2,099 drivers and 601 non-drivers were samples in 2020 before the COVID-19 pandemic and in 2021 during it as part of the RSM annual poll. -Participants were asked about their speeding, alcohol- drug and polysubstance impaired driving, fatigued and distracted driving, and seatbelt use.	Canada	-In Canada, stunt driving in law is defined as driving 50 km/h over the limit.	4
(VINGILIS ET AL., 2020)	Consider effects of COVID-19 on road safety	-Speeding and stunt driving has increased significantly during covid	-An interactionist model used to generate research questions. No primary data collected.	International	“speeding and stunt driving”	N/A

Appendix 6 – Literature concerning the association of crashes and hoon behaviours

Table A6. Literature concerning the association of crashes and hoon behaviours

REFERENCE	OBJECTIVE	MOTIVATIONS AND ASSOCIATED FACTORS	METHODS	COUNTRY/ JURISDICTION	HOONING BEHAVIOUR/ HOW HOONING IS DEFINED	RESEARCH QUALITY RATING
(BREEN ET AL., 2020)	Identify immediate precedents for young driver crashes.	-In this sample, 74% were male, 80% were speeding. -92% of drivers were considered culpable for the crash. -Speeding was more common with passengers than solo driving.	-All driver under 25 years old who were hospitalised by a vehicle crash in 2013-2016 in south-east Norway were analysed (N=145)	Norway	-Excessive speeding was anything over the speed limit.	2
(HØYE, 2020)	Investigate speed and impaired driving crash fatalities	-Speeding and DUI drivers in crashes more often male, unbelted, unlicensed, driving old cars, and in single-vehicle crashes on low-volume conditions. Also less fatigued, less ill and less suicidal. Excessive speeders younger.	-1,591 crashes involving 1,949 cars between 2005 and 2015 were analysed	Norway	Excessive speeding defined as 20/30 km/h over the limit if limit under/over 60km/h respectively.	2
(KAR ET AL., 2018)	Analysis of survey on adolescent street race, risky driving and crash risk.	-13% of sample reported driving in a street race. -Driving in a street race was significantly associated with other risky driving behaviours, but not independently associated with crashes. -Young Black, Latino and mixed race low-SES drivers most likely to engage in street racing.	-NEXT Generation Health Study (N=2,395). Risky driving, street racing, self-reported crash and demographic variables for adolescents obtained from 2009-2010. -Binomial logistic regression used to analyse data.	USA	focus on street racing	2
(WICKENS ET AL., 2017)	Analyse relationship between self-reported street racing and crash experience	-Self-reported street racing behaviour was associated with a 5.23 x increase in odds of being in a crash in the last 12 months, even after controlling for demographic, driving exposure, and driving after use of alcohol and cannabis measures. -Street racing more prevalent among males aged 18-25.	-11,263 respondents to CAMH monitor (2009-2014) were surveyed. -0.9% of respondents reported to have driven in a street race in the last 12 months. -Hierarchical-entry binary logistic regression was used to analyse the data.	Canada, Ontario	“By ‘street racing’ we mean any type of race on public roads. This could include an organized race between two or more drivers, or a driver challenging other drivers on a public road or a single driver racing to see how fast he or she can go.”	2
(VINGILIS ET AL., 2014)	Examine relationships between ADHD, other mental health problems, substance use, and driving including street racing.	-There were no statistically significant differences between those with or without ADHD symptoms on self-reported drink driving, smoking weed and driving, street racing, or collision involvement. -Self-reported collision involvement more likely with younger drivers who drive more kilometres a week (sequential regression) -Racing significantly associated with self-reported racing. (chi-square tests). 9 respondents who raced in the past year (25.7%) also crashed in the past year, compared with 26 who raced and didn't crash. 5.9% of respondents who didn't race crashed in the last year.	4,014 Ontario residents participated in survey, 3,485 had a valid driver's license, 3.22% had ADHD symptoms.	Canada, Ontario	Street racing	2
(CLARK ET AL., 2011)	Explore effectiveness of vehicle impoundment legislation	-Hooning was mostly done on primary arterials (30%), then local roads (20%), secondary arterials (16%) and freeways (14%). 58% of hooning occurrences. -59% were alone in their cars at time of offence, 29% had 1 passenger, 12 % had two or more passengers. -When asked about usual hooning behaviour, 45% reported doing it alone, 22% reported only with others, and 33% reported usually hooning while both alone and with others. That being said, focus group suggested that hooning behaviours most often done in groups with each person in their own car. -8 participants had been driver in crashes, 3 of which were self-attributed to hooning. 9 were passenger in crashes, 6 of which attributed to hooning.	-Analysis of Victoria Police impoundment data. Most participants contacted from Impoundment Unit + snowball procedure. -Survey completed by 52 drivers whose vehicles had been impounded (50 male, 2 female, 16-46 years old with 83% younger than 28 years old) -Focus groups conducted with 21 respondents (18 male, 3 female) in two groups. -65% of respondents had 1 offence. 38% did 'loss of traction' resulting in	Victoria	Losing tyre traction, causing excessive smoke and noise. Maybe speeding > 45 km/h over limit(?)	2

REFERENCE	OBJECTIVE	MOTIVATIONS AND ASSOCIATED FACTORS	METHODS	COUNTRY/ JURISDICTION	HOONING BEHAVIOUR/ HOW HOONING IS DEFINED	RESEARCH QUALITY RATING
(LEAL & WATSON, 2011)	Evaluate crash risks from illegal street racing	<ul style="list-style-type: none"> -53% of participants reported hooning spontaneously, with 20% planning to hoon. Hooning spontaneity could compromise the effectiveness safe race track meets as an intervention. -Participants reported engaging in hoon behaviours for the buzz or thrill of it. -Only 3.7% of the 848 street racing and hooning offences resulted in a crash, and none of those crashes were fatal. --Of the 31 crashes, 25 were single vehicle, and 20 were colliding with a fixed object. -Offender sample had more traffic infringements, licence sanctions and crashes. 	<ul style="list-style-type: none"> impoundment, 37% were speeding 45-120 km/h over limit. -848 street racing and hooning offence descriptions were obtained from Queensland Police Service CRISP database and analysed. -802 male offenders' crash histories were compared with an age-matched control group. 	Australia, Queensland	Street racing and associated risky behaviours (burn outs, donuts etc.)	5
(PALK ET AL., 2011)	Characterise people most likely to hoon and examine relationship between hooning frequency and self-reported crash involvement	<ul style="list-style-type: none"> -Young male drivers most likely to engage in hoon behaviours, but still a sizeable proportion of female hoons (~25% of female respondents) -42.7% of respondents reported to have engaged in a hooning behaviour at least once in their life. 4% reporting hooning more than 50 times. 17.7% reported intentions to hoon again. -Highest hooning frequency in 20-24 year ages (20%), followed by 16-19 year (13%) -Most common hooning behaviour was racing or dragging (50.7%), followed by burnouts (47.2%). -10.4% of respondents (20.3% of those who had hooned at least once) reported being involved in a crash while hooning, and those who crashed were more likely to be male, had a speeding infringement, and engaged in street racing. 	<ul style="list-style-type: none"> -717 participants completed a questionnaire. -Participants were drivers in Queensland recruited with snowballing technique -Logistic regression conducted. -Participants reported frequency and intention to engage in future hooning by specific behaviour (hooning, cruising etc.) -Participants also reported if they have been involved in a crash while hooning. -Most participants were university students 	Queensland	<p>"The use of vehicles in an anti-social, 'loutish' and dangerous manner".</p> <p>Questionnaire split hooning behaviours by: burnouts, donuts, drifting, racing or dragging, organised group racing, cruising and rolling road blocks</p>	2
(LEAL ET AL., 2010)	Explore the riskiness of young male drivers who have been convicted of illegal street racing.	<ul style="list-style-type: none"> -Drivers in the group who has been convicted of street racing were more likely to have been involved in a crash (22.3% vs 8.7%). -Crash severity did not significantly differ between groups. -Contributing circumstances to crash also did not significantly differ (power issues), though 4 racer's crashed due to speeding compared with 0 in comparison group. -Drivers in racer group were significantly more likely to have have infringements due to speeding (67.8% vs 33.3%), defect or modified vehicles (37.7% vs. 9.3%)m hooning related offences (41.0% vs. 6.0%) and other offences (66.7% vs 27.3%). -Racer group also more likely to have previously had license sanctions. 	<ul style="list-style-type: none"> -366 driving histories were collected: 183 young male drivers with illegal street racing convictions (all male drivers convicted for street racing in Queensland between July 2005 and September 2006) and 183 other drivers matched by age distribution and gender. -Only 7 female drivers had been convicted of street racing in the studied time period, so they were not included in analysis. -Traffic and crash histories collected from CRISP and TRAILS databases in Queensland for comparison group, and potentially outside of Queensland for racer group. 	Queensland	"Illegal street racing and associated risky driving behaviors are collectively known as "hooning" in Australia. The associated behaviors include activities such as "burnouts," "donuts," "drifting," and unnecessary speed or acceleration" (p16)	5
(COLICCHIO & PASSOS, 2010)	Examine driving behaviour of medical students.	<ul style="list-style-type: none"> -From both 1997 and 2008 samples together, 59% drove after drinking alcohol, 21.5% of which had consumed large amounts of alcohol. -10.5% of respondents had participated in illegal street racing (12.5% of men, 3.4% of women). -19.2% of all respondents had been involved in a crash (42.9% of those who had been street racing had been involved in a crash, 	<ul style="list-style-type: none"> -354 medical students at Universidade de São Paulo participated in the survey in 2008. -This was combined with a sample of 377 students from 1997. 	Brazil, São Paulo	Street racing and drink driving.	4

REFERENCE	OBJECTIVE	MOTIVATIONS AND ASSOCIATED FACTORS	METHODS	COUNTRY/ JURISDICTION	HOONING BEHAVIOUR/ HOW HOONING IS DEFINED	RESEARCH QUALITY RATING
(PERRY & MCGILLIAN, 2008)	Provide overview of Victoria's Anti-Hoon Legislation (1 July 2006).	31.1% who has drove while heavily intoxicated had been in a crash). -2008 sample only showed reduction in drinking alcohol before driving. -29 casualty crashes in 2003 involving 18-25 year olds were analysed. 26 involved excessive speed, 12 alcohol/drugs, 9 hooning. These crashes made up 60% of 18-25 year old road fatalities in 2003.	-Not clear where crash data comes from, presumably police databases.	Australia, Victoria	<ul style="list-style-type: none"> •Improper Use of Motor Vehicle – defined as “intentional loss of traction to one or more wheels” • Careless Driving – with Improper Use • Manner Dangerous – with Improper Use • Engage in/Conduct Speed Trials Fail to Have Proper Control – with Improper Use • Undue Noise/Smoke – with Improper Use • Drive Whilst Disqualified/Suspended • Exceed Speed Limit – by 45Km/h or more; or travel at 145Km/h or more in a 110 Km/h zone” 	N/A
(LI ET AL., 2008)	Model crash risks for street racers in Utah	-Drivers who had no street racing citations were three times more likely to be at zero risk of a crash?. -Drivers with higher non-street-racing citations had similar crash risks to those with street-racing citations.	-Crash data from 1993-2002 obtained from Utah Department of Transportation, Division of Traffic and Safety. -Zero-inflated negative binomial model used to analyse data.	USA, Utah	Street racing	2
(GEE KEE, STEINHARDT, ET AL., 2007)	Analyse predictive abilities of expanded deterrence theory (Stafford & Warr, 1993) and Aker's (1977) social learning theory for hooning behaviour.	-Deterrence theory accounted for 43% of variance in willingness to hoon. Significant predictors specifically were Perceived Severity of Punishment, Punishment Avoidance and Knowledge of Punishment. -Social learning theory accounted for 66% of variance in willingness to hoon. Significant predictors were attitudes and rewards. -Combining the models explained 71% of the variance in willingness to hoon. Each model accounted for some unique variance. Social learning theory predicted 29% unique variance beyond deterrence theory. Deterrence theory, 6% unique variance. -Social learning theory predicted hooning behaviour better than deterrence theory, highlighting how the social nature of hooning behaviour should be a target of interventions.	-717 uni students participated in an online survey. -Survey included measures for extended deterrence theory (perceived risk of apprehension, swiftness of punishment, vicarious punishment avoidance, etc.) and measures for social learning theory (differential association, attitudes, rewards, punishments, and imitation). -Dependent variable was one item: “In the future, how willing would you be to engage in hooning behaviours?” with responses categorised into a likely/unlikely binary.	Queensland	<p>“Hooning is a general term used to characterise a number of mostly illegal driving acts, including street racing, time trials, excessive speeding, burnouts, cruising, drifting and rolling road blocks.” (p1)</p> <p>Tabulated definition with reference to Folkman (2005) and Jarred (2002)</p>	2
(KNIGHT ET AL., 2004)	Measure prevalence of street racing related fatal crashes in USA.	-315 (0.21%) of fatal crashes involved street racing, resulting in 399 fatalities. -Street racing fatal crashes more likely to be on urban roadways and while >65 mph. -Street racers most likely to be male teenagers.	-NHTSA Fatality Analysis Reporting System data (1998-2001) was analysed. -149,568 fatal crashes analysed.	USA	Street racing	2
(LEIGH, 1996)	Understand motivations of street racers in Australia	-First recorded street race in Australia was in 1932. -Street racers typically aged 16-25, share features of youth gangs including social exclusivity and territoriality, and is transitory with most people only racing for 2-3 years. -80-90% of people at a illegal street race are spectators, and most	-Interviews with street racers and attending illegal street races in Sydney. -Also interviewed police, legal drag racers, and others interested in street racing.	Australia, Sydney	Street racing, typically quarter mile drag races in industrial areas, attended after an initial meet up (typically at a McDonalds) to decide who will race and where.	n/a

REFERENCE	OBJECTIVE	MOTIVATIONS AND ASSOCIATED FACTORS	METHODS	COUNTRY/ JURISDICTION	HOONING BEHAVIOUR/ HOW HOONING IS DEFINED	RESEARCH QUALITY RATING
(MCCARROLL & HADDON JR, 1962)	Analyse fatal crashes in New York City	<p>spectators seem to be preparing their own vehicle to race one day.</p> <p>-Sunday crowds largest with 1-3 hundred people. Easter Sunday evening particularly large.</p> <p>-90-95% male and mostly Anglo-Saxon, with some Italian and Greek Australians, similar to demographics of legal motorsport spectators.</p> <p>-Most spectators are employed or in education, unlike other juvenile crime. Most are lower to middle class. Cars are expensive.</p> <p>-One participant reported paying \$5000 in fines over 4 years but was "one of the luckier ones".</p> <p>-"street racing and a commitment to the norms of mainstream society are highly compatible" (p6)</p> <p>-Unlike in the US, there is little gambling in Australia illegal street racing. Also generally do not engage in fighting, stealing, or drugs.</p> <p>-There was one drag strip with one monthly legal race. Most participants in illegal racing were also at the legal race.</p> <p>Interviewees suggested that there was less illegal street racing in Melbourne because they had more frequent legal races.</p> <p>-However, racers do often seem to get some thrill from the fact that what they are doing is illegal.</p> <p>-Cars have been socially constructed as masculine and racing is competition of masculinity within the same values presented in the dominant culture.</p> <p>-46% of people responsible for crashes had BAC levels > .25 g/dL</p> <p>-One driver was killed in a drag race.</p>	-Analysis of fatal crash data in new York City 1962.	USA, New York	Drag racing caused one death.	2

Appendix 7 – Australian jurisdictions considered for consultation

Table A7. Australian jurisdictions considered for consultation

JURISDICTION	#RESULTS IN FACTIVA WHEN SEARCHING “HOON*”	INTERVENTIONS ATTEMPTED OR CONSIDERED
ADELAIDE (SOUTH AUSTRALIA)	From other sources (not Factiva)	Task Force Diagonal (Newitt, 2012) -widespread media of the task force shut down one hoon driving club -pressure, education and enforcement; persistent and consistent -aim was to break down the culture -worked with local residents and businesses -video surveillance and overt policing
BAYSIDE COUNCIL (NEW SOUTH WALES)	From other sources (not Factiva)	Smart camera technology – ‘hoon cams’ – with licence recognition Working group to lobby state and federal government – for change and resourcing
BRIMBANK (VICTORIA)	From other sources (not Factiva)	-By-laws to make attending, photographing or encouraging hooning events illegal. --Goal was to address both the hoons and the spectators. --Their first step was to define what a hoon event was. ““hoon event” means one or more vehicles being driven in a manner involving either, the loss of traction, racing, time trials, or by which undue noise or smoke is caused; -Collaboration with Police.
BRISBANE CITY COUNCIL (QUEENSLAND)	23	-Skid-resistant road treatment (Allawah Rd, Chuwar, in May 2019) (Elliot, 2019a, 2019b; Sanderson, 2019) – rough surface to shred tyres when lose traction - sought resident feedback and monitored for physical signs of hooning (tyre marks and fuel spillage) -QPS assist with complaint data and recording hooning activities - 12 month trial and then roll out to another 11 sites - complaints fell to 0 -Curfew of hot spot (Outlook Drive, Mount Gravatt closed from 11pm to 6am from end of 2009) (Davis, 2009)
GOLD COAST CITY COUNCIL (QUEENSLAND)	15	- Mobile CCTV (with licence plate recognition and low-light capability) in partnership with QPS - six month trial in targeted hotspots - in last 2 years (2019-2021) 45% of CCTV requests related to hooning - Polair helicopter (drones) used to find individuals involved - identified car enthusiasts as a different group; hoons buy cheap cars - occurring around Bathurst 1000 and Gold Coast 600 Supercars event – Testing skills on temporary track in Surfers Paradise – use cameras to monitor - May 2021 – Operation Tango Vinyl - curbed gatherings but not hoon behaviours - phase 1 – targeted hoons - phase 2 – targeted organisers - encourage locals to record - asked for more cameras and traffic calming devices
HUME CITY COUNCIL (VICTORIA)	18	-One article proposed a separate safe space for burnouts away from residential areas -Also considering skid-resistant bitumen
IPSWICH CITY COUNCIL (QUEENSLAND)	5	2012 – traffic calming measures, speed humps, splitter islands, lowered speed limits 2011 – not implementing speed humps as often install and then have to remove; is a challenge for hoons -removal of speed humps saw a dramatic increase in speeding and hoon complaints -compromise with kerb build-outs or chicanes
KALAMUNDA SHIRE (WESTERN AUSTRALIA)	7	-Four options presented by Gooseberry Hill residents to reduce hooning on Zig Zag Scenic Drive (Hills Gazette, 2013): --Closing the road to motor vehicles. --Providing a security patrol service --Review the nearby road network --Increase maintenance like trimming vegetation, increase visibility. Threats received by residents after the announcement to implement above plans 2016 – new laws to confiscate vehicles passed 2014 – traffic calming and others were not successful

JURISDICTION	#RESULTS IN FACTIVA WHEN SEARCHING "HOON*"	INTERVENTIONS ATTEMPTED OR CONSIDERED
KNOX CITY COUNCIL (VICTORIA)	7	<p>2021 – trialed as a shared path (ped and cycl); was closed for six months in 2020 (and extended additional 6 months) but re-opened in July 2021 to vehicles during the day – this is a 12-month trial; at night has locked gates</p> <ul style="list-style-type: none"> -Increasing police awareness and putting out call for incident reports (Miles, 2012). -Traffic Enforcement Group installed a covert camera but it failed to catch any hoons on Sorensen Road in the 8 days (over Christmas) since it was installed, despite reports of hooning in the area continuing (Hills Gazette, 2012) -Main Roads WA planned to install a painted median strip along the road to calm traffic and protect pedestrians (Hills Gazette, 2012). -Police apparently can not do anything for past hooning behaviour reports without a registration number (Hills Gazette, 2009). -Mobile speed bumps made out of recycled tyres installed to prevent hoons with big community support. Mobile speed bumps of this kind had apparently been previously trialed in Joondalup, Melville, Rockingham, Subiaco and Vincent precincts to great success (Midland Kalamunda Reporter, 2009) --Interesting. This is inconsistent with other reports that speed humps do not deter hoon driving. Perhaps there was something special about these mobile speed humps? Implied nearby enforcement? <ul style="list-style-type: none"> -2011 – believe state responsibility and therefore police <ul style="list-style-type: none"> - hoons treat speed humps as a challenge - 2012 damaging speed humps installed and later replaced (too high and invisible at night) - 2014 councillors voted to conduct report into cost of speed humps <ul style="list-style-type: none"> - asked police to increase surveillance - believe need to work with surrounding areas - 2014 refreshed line marking – now striped with tyre marks – and added a stop sign to complement a chevron sign and traffic island near her home - 2019 council said would consider traffic calming devices in budget
LOGAN CITY COUNCIL (QUEENSLAND)	18	<ul style="list-style-type: none"> -Cameras incl. "high tech camera equipment" (Braithwaite, 2011; Kerr, 2019; Williams, 2017) --Deputy Mayor Wendy Boglary lobbied Redland City Council to install cameras at Wellington Point to stop hooning (Williams, 2017). -However, hoons sometimes steal registration plates (Braithwaite, 2011), which is a challenge to enforcement. -Speed humps not added because they don't deter hoons, despite residents requesting them (Kerr, 2018) -Increased police enforcement and vehicle inspection blitz (Australian Government News, 2011; Williams, 2017) -13HOON hooning hotline (Australian Government News, 2011) -Intel to find 'hooning hotspots' -Collaboration between police, council, local community groups, and local businesses (Forsyth, 2009). In Queensland, Logan City Council has installed no-stopping signs in its Loganholme industrial area to stop hooning behaviour by restrict parking between 6pm and 5am. (Australian Government News, 2011)
NORTH SYDNEY COUNCIL (NEW SOUTH WALES)	From other sources (not Factiva)	<p>Plans to do the following: (Power & Gladstone, 2021)</p> <ul style="list-style-type: none"> -CCTV -Speed humps -Large digital signboard with flashing signs to alert to the rules -Increase in parking spots to crowd out anti-social motorists
RANDWICK (NEW SOUTH WALES)	From other sources (not Factiva)	<p>Collaboration between council and police Anti-social driver behaviour - Randwick City Council (nsw.gov.au)</p> <p>Police – regular patrol; operations (Lethal, Kilowatt, Interceptor) in 2019 that involved external agencies (EPA) and media to educate and deter</p> <p>Council – temp traffic calming to narrow sections of the road, high visibility barricades, speed humps (consult with local communities prior to installing speed humps)</p> <ul style="list-style-type: none"> -CCTV in hotspots – footage transferred live to police (proactive and reactive policing) -Gate installed to off road areas -Parking restrictions -Encourage community to call local area command directly to report to police
REDLAND CITY COUNCIL (QUEENSLAND)	From other sources (not Factiva)	<p>2021 – not enough police but police conduct regular patrols in hotspots and proactive in meeting with community and government</p> <p>Cameras installed, depend on community to report</p> <p>2021 laws to shift onus of responsibility to vehicle's owner and not the driver</p> <p>Examine whether remote engine immobilisers can be fitted</p> <p>Qld got purchased drones to survey gatherings</p>
RICHMOND VALLEY COUNCIL (NEW SOUTH WALES)	9	<ul style="list-style-type: none"> -Newspaper articles about hooning in Richmond Valley are exclusively about beach hoons. Motorcycle and 4WD hoons on Northern Rivers beach are disrupting the ecosystem and there are considerations to close the beach to vehicles, which would affect fishers and other locals (Flemming, 2021). -In 2021 speed limit on the beaches was reduced from 30 km/h to 20 km/h (Flemming, 2021; Lollback, 2021) -Beach access points were closed so that there was only one entry and exit point, making it easier to catch hoons (Lollback, 2021)

JURISDICTION	#RESULTS IN FACTIVA WHEN SEARCHING "HOON*"	INTERVENTIONS ATTEMPTED OR CONSIDERED
SUNSHINE COAST REGIONAL COUNCIL (QUEENSLAND)	6	<p>-Police blitz involving speaking to bystanders, conducting RBTs and licence checks and fining hoons (Daily Telegraph, 2020).</p> <p>-Considered adding permit system for South Ballina beach (Turner, 2019)</p> <p>-Increase enforcement (ranger patrols) on the beach (Munro, 2019).</p> <p>-Education campaign and revision of beach signage (Munro, 2019).</p> <p>2015 – security gates and bollards</p> <p>2013 - The Sunshine Coast initiative with Caloundra 3 Neighbourhood Watch, Queensland Police Service and Sunshine Coast Council will mean that yellow signs will be put on residents’ rubbish bins reminding motorists it is 50kms - “50 In My Street” program – community did not want speed humps</p> <p>2011 – white lines that look like fake roundabout – not effective (reported by community)</p> <p>Close off a part of Mooloolaba Esplanade again over the summer holidays has proved favourable for business owners and patrons – road closures due to hooning complaints from communities</p>
TAMWORTH REGIONAL COUNCIL (NEW SOUTH WALES)	7	<p>-CCTV cameras installed and used to charge a man who damaged Gipps Street field by performing doughnuts (van der Graaf, 2018). Sergeant Buko said CCTV has been used to identify hoons before.</p> <p>-Hidden mobile security camera ‘blitz’ used to charge two men ‘driving recklessly and performing burnouts’ while also unlicensed. One might receive a prison sentence. The covert camera operation was in response to community complaints (Chillingworth, 2016). Several other drivers have also been caught with this undercover camera operation (Chillingworth, 2015)</p> <p>- Mobile and covert cameras</p> <p>- also offence to film hooning behaviours</p> <p>-Sports grounds have been vandalized a number of times, with responses being closing gates early and limiting access to the grounds (Northern Daily Leader, 2015a), though there was one instance of hoons taking advantage of protective bollards being removed over easter (Northern Daily Leader, 2015b).</p>
WOLLONGONG CITY COUNCIL (NEW SOUTH WALES)	7	<p>-Hoons doing burnouts on the North Wollongong rainbow crossing lead the council to repaint it with a more durable paint that can be cleaned more easily, and calls to install CCTV cameras. According to Cr Brown, rainbow crossing burnouts are general hoon vandalism not targeted homophobic acts (Tullis, 2020).</p> <p>-In another part of Wollongong (Helensburgh) there’s some controversy around whether Wollongong City Council should apply for state funding to install conspicuous CCTV cameras, or a 24 hour police station. Concerns are that new CCTV cameras would be an extra cost for council to monitor them (Humphries, 2021) and may or may not prevent hooning even if they are conspicuous and known by the community.</p> <p>-Concrete blocks installed to block vehicle access to Wombarra oval after it was vandalised by hoons twice (Tullis, 2019).</p> <p>-The term ‘hoon’ is sometimes used to refer to non-vehicle related vandalism too (Thompson, 2009).</p>
WYNDHAM CITY COUNCIL (VICTORIA)	5	<p>-No articles of particular relevance and recency.</p>