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Recommendations for a Graduated Licensing System for Motorcyclists in South Australia

MRJ Baldock

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TITLE

Recommendations for a Graduated Licensing System for Motorcyclists in South Australia

AUTHORS

MRJ Baldock

PERFORMING ORGANISATION

Centre for Automotive Safety Research
The University of Adelaide
South Australia 5005
AUSTRALIA

SPONSORED BY

Department of Planning, Transport and Infrastructure
GPO Box 1533
Adelaide SA 5001
AUSTRALIA

Motor Accident Commission
GPO Box 1045
Adelaide SA 5001
AUSTRALIA

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ABSTRACT

This report provides a review of the possible elements that could be included in a Graduated Licensing System (GLS) for motorcyclists in South Australia. The aim is to identify a set of GLS elements that are likely to lead to reductions in crash involvement among novice motorcyclists. The different elements are evaluated in terms of their demonstrated effectiveness or, if this is unknown, their likely efficacy based on general road safety principles. Candidate GLS elements were taken from a report for Austroads authored by Christie (2014). A model motorcycle GLS is then proposed, incorporating the elements most likely to lead to a safety benefit.

KEYWORDS

motorcycle, motorcyclist, licensing, graduated licensing, GLS, road safety, countermeasure, novice rider

Summary

Motorcyclists continue to account for a considerable proportion of South Australia's road trauma. From 2012 to 2016, motorcyclists comprised 17% of serious injuries and 12% of fatalities. Younger riders are over-represented in these crashes in terms of motorcycle licence and registration numbers (DPTI, 2017). At the time of writing, the number of motorcyclist fatalities in 2017 in South Australia is double the average for 2012 to 2016.

One countermeasure that has been successful in reducing the risk of crashes among novice drivers is the Graduated Licensing System (GLS). GLS work by imposing restrictions on novice drivers/riders and gradually lifting them as the drivers/riders progress through the different phases of the system. In this way, driving/riding experience is obtained initially in conditions of low risk, with more challenging conditions only encountered once a driver has reached a particular level of experience and maturity. Considerable effort has been directed into the development of GLS for car drivers in recent years, and most jurisdictions are now looking at strengthening or enhancing their motorcycle GLS.

The present report uses as its starting point an Austroads report on a GLS for motorcyclists by Dr Ron Christie (Austroads, 2014). Ron Christie was one of Australia's most eminent road safety experts and his Austroads report provides a comprehensive inventory of all possible elements that could be incorporated into a motorcycle GLS. South Australia has been monitoring GLS developments in other jurisdictions with a view to implementing best practice initiatives. In the present report, in Section 2, consideration is given to the elements that Christie recommended for a motorcycle GLS. In Section 3, consideration is given to elements that Christie argued needed more research before a recommendation could be made. Section 4 provides consideration of elements that Christie advised against including in a GLS. Section 5 lists recommendations based on the preceding sections. For each possible GLS component discussed in the report, consideration is given to the following:

- Christie's (Austroads, 2014) recommendations,
- whether or not South Australia already incorporates the element in its current GLS,
- other research findings related to crash risks or related countermeasures,
- best practice models for graduated licensing,
- GLS in other jurisdictions,
- and the components chosen for the Victorian GLS (the most recently restructured motorcycle GLS in Australia).

On the basis of the considerations given to the recommendations of the Austroads report, the GLS model shown in Table 1b is suggested for South Australia, with the current system shown above it in Table 1a. As can be seen in Table 1b, there are a number of changes recommended for riders, commencing with an increase in the age to obtain a learner permit, holding a learner permit for at least six months and further protective measures for learner riders including high visibility vest, no towing, night curfew, no phone use and a licence condition to ride only an automatic motorcycle licence if tested on one. In terms of R Date riders the minimum period is extended to three years. Table 1b shows that there would be a much longer timespan over which the GLS operates, meaning that these restrictions are in place for a longer time, allowing considerable riding experience to be gained in low risk conditions.

Table 1a: The current South Australian motorcycle GLS

STEP 1 Pre-learner	STEP 2 Learner permit R-Date endorsement	STEP 3 R-Date licence endorsement	STEP 4 R class licence endorsement	STEP 5 Full unrestricted R class licence
Minimum age 16	Minimum age 16	Minimum age 17	Minimum age 18	Minimum age 20
Pass the theory test (not required if already holds a driver's licence)	LAMS restricted	LAMS restricted	No LAMS restrictions	
Pass Basic Rider Safe Course	Zero alcohol/drugs	Hold R-Date for at least 12 months	(period on provisional licence for those without a full car licence)	
	Pass Advanced Rider Safe course	Subject to provisional P1 conditions (not required if already holds an unrestricted driver's licence)		
	Pass Hazard Perception Test (not required if already holds a driver's licence)			
	No pillion passenger unless a Qualified Supervising Driver			
	If no driver's licence already, must hold learners permit for at least 12 months or 6 months if over 25.			

Table 1b: The proposed South Australian motorcycle GLS

STEP 1 Pre-learner	STEP 2 Learner permit R-Date endorsement	STEP 3 R-Date licence endorsement	STEP 4 Full unrestricted R class licence
Minimum age 18	Minimum age 18	Minimum age 18 yrs 6 months	Minimum age 21 yrs 6 months
Pass the theory test (not required if already holds a driver's licence)	LAMS restricted	LAMS restricted	
Pass the Motorcycle Hazard Perception Test	Zero alcohol/drugs	Zero alcohol/drugs	
Pass Basic Rider Safe Course	No pillion passenger	No pillion passenger	
	Wear L plates	No towing	
	Wear high visibility vest	Night curfew if under 25	
	No towing	no phone use while riding	
	Night curfew	automatic motorcycle if tested on one	
	no phone use while riding	Hold R-Date for at least 3 years	
	automatic motorcycle if tested on one		
	Must hold learners permit for at least 6 months.		
	Pass Advanced Rider Safe course		

Although a stronger motorcycle GLS is a key component of an approach to reduce road trauma on South Australian roads, it is recognised that other countermeasures for motorcycle crashes are urgently needed. Therefore, the report concludes with a brief summary of other countermeasures that could be used to reduce the motorcycle crash numbers in South Australian into the future.

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1 Introduction

Riders of motorcycles are known to have a substantially higher risk of serious injury or fatal road crashes than other road users (Johnston, Brooks & Savage, 2008). Novice motorcyclists are also known to have a higher risk of crashes per unit of exposure than more experienced riders (Andrea, 2006; National Safety Council, 2009). Therefore, it is of value to implement safety measures that will reduce the risk of crashing for novice motorcyclists.

It is also an important consideration for South Australia, as motorcyclists continues to account for a considerable proportion of the State's road trauma. From 2012 to 2016, motorcyclists comprised 17% of serious injuries and 12% of fatalities. Over half of these serious casualty crashes were single vehicle crashes, while nearly half of those in metropolitan Adelaide occurred at intersections. Younger riders are over-represented in these crashes in terms of motorcycle licence and registration numbers (DPTI, 2017). At the time of writing, the number of motorcyclist fatalities in 2017 in South Australia is double the average for 2012 to 2016.

1.1 Graduated Licensing Systems (GLS)

One countermeasure that has been successful in reducing the risk of crashes among novice drivers is the Graduated Licensing System (GLS). GLS work by imposing restrictions on novice drivers and gradually lifting them as the drivers/riders progress through the different phases of the system. In this way, driving/riding experience is obtained initially in conditions of low risk, with more challenging conditions only encountered once a driver has reached a particular level of experience and maturity. Since 1997, Australia has had a National Driver Licensing Scheme (<http://www.austroads.com.au/drivers-vehicles/registration-licensing-program/australian-driver-licensing#Section2>) which sets out requirements for key elements of a GLS, as well as requirements for driving tests, driver testing officers, driver licence cards, and proof of identity.

GLS have proved successful in reducing road crashes among young novice drivers. A review by Senserrick & Williams (2015) determined that the components of a GLS with the greatest evidence of effectiveness in reducing novice driver crashes were:

- a minimum learner age of 16 years
- a minimum learner period of 12 months
- a minimum provisional age greater than 16 years (with increasing benefits with increasing age)
- night driving restrictions
- peer passenger restrictions, and
- a zero blood alcohol concentration limit.

There was also some evidence of effectiveness for a high number of supervised driving hours during the learner phase, and the requirement for hazard perception tests and exit tests (Senserrick & Williams, 2015).

1.2 GLS for motorcyclists

Considerable effort has been directed into the development of GLS for car drivers in recent years, and most jurisdictions are now looking at strengthening or enhancing their motorcycle GLS. A large amount of evidence is available for best practice in car driver GLS but evidence is generally lacking for motorcycle GLS (Haworth & Mulvihill, 2005).

There are GLS operating in all Australian jurisdictions but there is variety in the elements that are included in them. All motorcycle GLS in Australia nonetheless follow the best practice model (Christie, 2014) of involving three stages of licensing: learner, intermediate (restricted) and full (unrestricted). There are also nationally consistent requirements in terms of displaying L plates during the learner stage, being restricted to a Learner Approved Motorcycle Scheme motorcycle during learner and restricted stages, and being required to wear an approved motorcycle helmet. Variations exist in terms of minimum age requirements, minimum periods of time specified for different stages, mandatory training, assessment requirements, and the nature of restrictions in different stages (e.g. zero blood alcohol concentration).

Although motorcycle GLS have not received the same level of policy input as car driver GLS, most jurisdictions are now looking at strengthening or enhancing their motorcycle GLS. The jurisdiction that has most recently altered their GLS is Victoria in 2016. The new Victorian GLS requires that applicants for a learner permit complete a road rules knowledge test and then a two day rider training course which includes an on-road assessment. In order to progress to the next stage of licensing, riders need to complete a 'Check Ride', which is a half-day on-road coaching session; a Hazard Perception Test; and a 'Motorcycle Licence Assessment', which includes both off- and on-road assessments of riding ability.

Structure of this report

The present report provides consideration of each element of a possible motorcycle GLS as listed in Christie's 2014 Austroads report. First, in Section 2, consideration is given to the elements that Christie recommended for a motorcycle GLS. In Section 3, consideration is given to elements that Christie argued needed more research before a recommendation could be made. Section 4 provides consideration of elements that Christie advised against including in a GLS. Section 5 lists recommendations based on the preceding sections. For each possible GLS component discussed in the report, consideration is given to the following:

- Christie's (Austroads, 2014) recommendations,
- whether or not South Australia already incorporates the element in its current GLS,
- other research findings related to crash risks or related countermeasures,
- best practice models for graduated licensing,
- GLS in other jurisdictions,
- and the components chosen for the Victorian GLS (the most recently restructured motorcycle GLS in Australia).

2 GLS elements recommended by Christie (Austroads, 2014)

2.1 Three stage hierarchical model

Christie (Austroads, 2014) advocates the use of a three stage hierarchical model for a motorcycle GLS. This refers simply to the use of learner, intermediate and full licence phases. In South Australia, novice riders progress through a learner phase, followed by a period with an R-date licence, before progressing to a full R-class licence without restriction. This parallels the GLS for drivers, which incorporates learner, provisional and full licence phases. In keeping with the GLS philosophy, both SA car and motorcycle licence systems involve the progressive removal of restrictions as novices progress through the phases. The use of a three stage hierarchical model is consistent throughout Australia.

One point to note here in regard to the three stage hierarchical model is that it requires the gradual removal of restrictions as the rider progresses through the system. Many of the restrictions that can be placed on riders are likely to reduce risk for any rider, regardless of their level of experience. However, in order for the progression to subsequent phases to be meaningful, choices need to be made about which restrictions to lift at which stages of the system. In this way, it becomes necessary to choose the most important safety-enhancing restrictions so that these may remain during the intermediate phase, and removing other restrictions despite the possibility that they may continue to confer a safety benefit if still applied.

One further point to note here in regard to the current South Australian system is that the intermediate phase is treated very differently according to whether or not the rider already holds a full car licence. If a rider holds a full Class C car licence, the R Date licence is really just an additional 'class' added to the existing full car licence. Once someone with a full car licence passes the Advanced Rider Safe course, the R Date class is added to their licence and they are merely restricted to a Learner Approved Motorcycle Scheme (LAMS) motorcycle (see Section 2.16) for 12 months (Department of Planning Transport and Infrastructure, personal communication, November 2017). This has significant ramifications for the capacity of the system to apply restrictions to the intermediate phase of the motorcycle GLS. It may be that certain recommendations made throughout this report will require legislative adjustments that allow the motorcycle licence class to be treated entirely separately from the Class C car licence.

Recommendation: As South Australia already has a three stage hierarchical model in place, which parallels the car GLS and is consistent with other Australian jurisdictions, there is no need for change.

2.2 Requirement for 12 months car licence tenure

It was argued by Christie (Austroads, 2014) that those who wish to obtain a motorcycle licence should first hold a car licence for a period of 12 months. That is, people should have to hold a provisional car licence for 12 months prior to obtaining a motorcycle learner permit. This potential GLS requirement is based on the principle that a GLS involves obtaining experience in lower risk conditions before progressing to phases in which greater risks are encountered. Driving a car involves a lower level of risk than motorcycling, so the novice progresses from learning to drive a car to the more difficult and risky task of learning to ride a motorcycle. It means that the prospective rider gets used to the overall road and traffic environment while in the comparative safety of a car or similar, rather than having to learn to cope with traffic while also mastering road craft and motorcycle handling. In this way, a motorcycle licence becomes like a more 'advanced' form of licence, in the same way that a driver needs to have a car licence before a heavy vehicle licence; the latter is a more 'advanced' licence. This was one of the

suggestions put forward in a recent Discussion Paper for motorcycle licensing by the SA Department of Planning, Transport and Infrastructure (DPTI, 2012).

This requirement would also result in an additional year of maturation prior to obtaining a motorcycle licence. Christie reports evidence (SWOV 2009; VicRoads 2010) that there is a lower crash risk for motorcyclists at any licence level who begin riding at an older age, although it should be noted that these findings may also result from a degree of self-selection (i.e. it may be that certain types of people with a higher crash risk choose to ride at a younger age).

This requirement for 12 months of car licence tenure prior to motorcycle licensure was introduced in Queensland in 2007. A review of the effect of the change on licensing patterns (Haworth, Rowden & Schramm, 2010) found that “instead of obtaining a licence at 17 years of age, riders now wait until they are 18... It appears that the legislation may not have deterred young riders from obtaining a licence, they merely wait longer” (p13). Therefore, this requirement did not appear in Queensland to have a marked effect on access and mobility. Furthermore, it is also known that the majority of motorcycle learner permit applicants already hold a car licence, so this change will not affect a large proportion of novice riders. However, given the relationship between a young age and elevated crash risk, this proposed requirement would affect those novice riders with the highest crash risk.

In terms of the effect of the Queensland licensing requirements on crash numbers, it is apparently difficult to disentangle the effects of this change from other changes also introduced at the same time (Narelle Haworth, QUT, 2017, personal communication).

Although the requirement for 12 months of car licence tenure prior to obtaining a learner motorcyclist permit is very much in keeping with the theory behind GLS models (gaining experience in low risk environments before graduating to more challenging tasks), it is likely to be a contentious addition to the GLS. The new Victorian model did not require a minimum period of time with a car licence prior to obtaining a learner motorcyclist permit, citing a potential ‘negative impact on social mobility’.

However, it needs to be borne in mind that Victoria already requires people to be 18 years of age before obtaining a motorcycle learner permit, while in SA the minimum age for a learner permit is 16, which is the lowest minimum age in Australia (equivalent to the Northern Territory and Western Australia). This two year difference is a substantial one. Research has found that younger riders, whether new or fully licensed, have more crashes per distance travelled than older riders, suggesting that age itself, irrespective of experience, is an important determinant of crash risk. For example, a study in New Zealand by Mullin, Jackson, Langley and Norton (2000) assessed various crash risk factors using a population based case control method. They found that riders older than 25 had less than half the risk of those aged 15 to 19. Greater riding experience had a protective effect in a univariate analysis, but once age and other confounders were controlled for, this effect was no longer evident. The authors concluded that “licensing regulations should continue to emphasise the importance of increased age” (Mullin et al., 2000, p32). A similar conclusion that a higher licensing age should be a key component of motorcycle licensing systems was reached by Haworth and Mulvihill (2005) in their review of rider training. Studies on car drivers have also found that a higher licensing age has road safety benefits (Begg & Langley, 2009; Trempel, 2009; Twisk & Stacey, 2007; Williams, 2009; Williams, Chaudhary, Tefft & Tison, 2010). VicRoads have produced an estimate of the likely impact of reducing the minimum driving age in Victoria from 18 to 17. Their estimate was an additional 10 fatalities, 241 serious injuries, and 714 injuries per year (Parliament of Victoria, 2017).

Recommendations: In Victoria, a prospective motorcyclist must be 18 years old before being able to apply for a learner motorcycle permit. The required age for a car learner permit is 16; the required age

for a probationary car licence is 18. The Victorian system most likely effectively encourages people to learn to drive a car before a motorcycle but does not mandate it. This option would appear to be more fair for those who wish only to ride a motorcycle. It is also likely that the greatest benefit of the car licence prior to attaining a motorcycle licence class is by-product of a delay in exposure and greater maturation at an older age. These can be achieved by simply mandating an older learner permit age without mandating a car licence first. It is therefore recommended that South Australia follow the Victorian system. Accordingly, the minimum age for a motorcycle learner permit in South Australia should be raised to 18 but a minimum tenure with a car licence should not be a requirement for applying for a motorcycle permit.

2.3 Minimum tenure periods for learner and intermediate phases

The idea behind specifying minimum time periods in the learner and intermediate phases is to give novice riders “time to accumulate experience and skills over time under GLS conditions without rushing to meet testing requirements” (Austroads, 2014, p25). Christie also argues that there should be no exemptions or minimum reductions in time periods awarded on the basis of any training programs, citing evidence from car GLS that such exemptions from minimum time periods in learner or intermediate phases increases subsequent crash risk (Lewis-Evans 2010; McCart et al, 2010).

In South Australia currently, a learner rider who does not hold a car licence needs to have their learner permit for 12 months before they can advance to the intermediate phase (or 6 months if they are aged over 25). However, a rider who already holds a car licence does not need to hold a learner permit for a minimum period prior to advancing into the intermediate phase. Such riders are ‘recommended’ to hold a learner permit for six months prior to applying to complete the Rider Safe advanced training course that is the gateway to an R-Date licence class. This ‘recommendation’ is not a requirement. In other states, the requirement varies between three months and six months, except in Western Australia (no requirement). The requirement for six months with a learner permit before undertaking the Rider Safe Advanced Course was one of the suggestions put forward in a recent Discussion Paper for motorcycle licensing by the SA Department of Planning, Transport and Infrastructure (DPTI, 2012).

In regard to the intermediate phase, the R-Date licence class needs to be held for a minimum of 12 months before the rider can apply for an unrestricted ‘full’ licence. There are some other Australian jurisdictions that have a similar minimum tenure for the intermediate phase, but Victoria, New South Wales and the Australian Capital Territory all have a three year minimum. A best practice motorcycle GLS requiring considerable riding experience before a full licence would incorporate the longer minimum intermediate phase tenure of these jurisdictions.

Recommendation: The aim of a GLS is to ensure that novices obtain experience in low risk conditions for a considerable period before advancing to less restrictive licensing phases. Having a minimum tenure period for each phase of a motorcycle GLS would help serve this objective, along with the imposition of various restrictions advocated in the present report for the learner and intermediate phases. It is recommended that the learner phase should have a minimum tenure of six months, and intermediate phase (R-Date licence) should have a minimum tenure of three years. These periods should apply regardless of other licences held, and regardless of age.

2.4 Clean record for graduation to next GLS level

This proposed requirement refers to riders needing to have a minimum offence-free period prior to graduating to the next GLS phase. This potential component of a GLS, according to Christie (Austroads, 2014, p26), “encourages compliance with road laws and GLS conditions and may reduce volitional risk taking.” Christie also cites research finding that motorcycle crashes often involve risk taking and

disobedience of road laws, which suggests that addressing these problematic behaviours in the novice rider phase may have safety benefits if law-abiding behavioural patterns can be entrenched.

In South Australia currently there are no minimum offence-free periods that need to be demonstrated before a rider can graduate to the next level of the GLS. There are, however, lower levels of demerit points that can be accumulated before a licence is disqualified (a maximum of four points for both learner and provisional riders). Such a system is consistent across Australia (see Section 2.12 below).

Recommendation: Currently, in South Australia, as elsewhere in Australia, behaviour during the GLS for car drivers and motorcyclist is controlled through lower demerit point limits than apply for full licences. The demerit point limits are likely to be sufficiently low that they effectively require very low rates of non-offending. If these low limits are also applied to the longer minimum periods of tenure in the different GLS phases recommended above (2.3), then novice riders will have to maintain long periods of non-offending in order to progress through the GLS. For this reason, it is not necessary to recommend minimum offence-free periods before graduation to subsequent GLS phases.

2.5 Display of distinctive plates

The use of distinctive ('L', 'P') plates identifies novice riders on restricted licences to police. This should serve to encourage adherence to licensing restrictions, especially those that can be determined on visual inspection (e.g. restrictions on pillion passengers). South Australia requires the display of particular plates for the learner and P1 phases of the car GLS. For the motorcycle GLS, the same rules apply except that, if a rider with an R-Date licence (intermediate, restricted stage) holds a full car licence, that rider does not need to display 'P' plates when riding their motorcycle.

An issue with this situation is that riders with an R-Date licence are subject to certain restrictions that do not apply to riders with a full R-licence and, without a P plate being displayed, it will not be possible to assess on visual inspection whether the rider needs to be complying with R-Date conditions.

Currently, P plates for those with an intermediate motorcycle licence are required in the ACT, New South Wales and Tasmania, and in Victoria for those without a full car licence.

Recommendation: South Australia should require riders with an R-Date licence class to display P plates whilst riding.

2.6 Mandatory carriage of licence

The point of requiring mandatory carriage of licence is to deter unlicensed driving or riding. Motorcyclists are over-represented among those detected operating a vehicle for which they do not have an appropriate licence (Catchpole, 2010; Knox, Turner, Silcock, Beuret & Metha, 2003; Reeder, Chalmers & Langley, 1995; Watson, 2011; Watson & Steinhardt, 2006; Wylie, 1998) and so mandatory carriage of licence is a potentially important requirement for this group of road users.

South Australia already has a mandatory carriage of licence law in place for certain licence classes such as Heavy Vehicle drivers and Motor Driver Instructors, other motorists are able to produce the licence at a later date if not carrying at the time they are stopped by police. Therefore, the current law is not a 'strict' mandatory carriage of licence law and would allow motorists the opportunity to provide a false name and address at the roadside and evade detection. Many researchers in the road safety field have called for strict mandatory carriage of licence for all operators of motor vehicles and it was also recommended in an Austroads report on countermeasures for unlicensed driving (Baldock, Royals, Raftery, Bailey & Lydon, 2013). Surveys have indicated strong community support for mandatory licence carriage laws, with a majority of Australians believing the laws are already in place. Notably, a recent

licence check study by Watson et al. (2011) found that 97% of over 3000 motorists checked were carrying their licence at the time in a state (Queensland) without strict mandatory carriage of licence laws.

Recommendation: Strict mandatory carriage of licence laws could be considered in South Australia for all operators of motor vehicles, which includes motorcyclists. These laws would remove the opportunity for motorists to produce their licence at a later date or time and may help deter unlicensed motorcycle riding.

2.7 No carriage of pillion passengers

A Discussion Paper prepared by VicRoads (2010) for the new motorcycle GLS noted that carrying a passenger makes the task of balancing a motorcycle more difficult. It may also result in distraction and encouragement of risk taking, both of which are given as reasons for passenger restrictions applied to novice drivers. Restricting riders with an R Date licence from carrying pillion passengers was also one of the suggestions put forward in a recent Discussion Paper for motorcycle licensing by the SA Department of Planning, Transport and Infrastructure (DPTI, 2012).

Although discussions of pillion passengers often focus on the risk of crashing, there are also the additional risks of injury to the pillion. It has been found that pillion passengers are more likely than riders to be killed or injured in crashes (Christie & Harrison, 2002).

The new Victorian motorcycle GLS does not permit pillion passengers for either those on a learner permit or intermediate restricted licence (Senserrick et al., 2015). In the Australian Capital Territory, New South Wales, Queensland and Tasmania, pillions can be carried during the second part of the intermediate licensing phase (P2 phase in NSW and Tasmania).

In South Australia currently, riders with an R-Date licence are permitted to carry a pillion passenger. Riders with a learner permit are not allowed to carry pillions unless the pillion is a Qualified Supervising Rider (someone who has held an unconditional motorcycle licence for the preceding two years).

Recommendation: As a pillion is likely to make riding more difficult for a novice, both in terms of maintenance of balance and as a potential source of distraction, and as pillions have a greater risk of serious injury than riders in the event of a crash, it is recommended that South Australia prohibit riders on learner permits and R-Date licences from carrying pillion passengers.

2.8 Night-time Curfew

Novice riders are known to have higher crash rates at night (WA Department of Transport 2010; VicRoads, 2010) and so a night time curfew for novice motorcyclists is a potential countermeasure for novice rider crashes. The higher night-time crash risk is likely to be due to a number of factors. These include reduced visibility of hazards for the motorcyclist, reduced visibility of the motorcyclist from the point of view of other road users, and possible association with other risky behaviours (e.g. alcohol use) or conditions (e.g. sleepiness).

Such curfews are already in place for car drivers as part of the GLS in some Australian jurisdictions, including South Australia. Senserrick and Williams (2015) identified night-time driving restrictions as one of the car GLS components with clear evidence for effectiveness in reducing novice driver crashes.

The South Australian curfew for car drivers applies from midnight to 5am for those aged under 25 with a provisional licence (P1). A curfew during these hours also applies for learner motorcyclists under 25 unless they hold a P2 or full car licence, or have a Qualified Supervising Rider present.

The new VicRoads motorcycle GLS does not include a night-time curfew despite it being raised as a possibility in the Discussion Paper (VicRoads, 2010). However, it is noteworthy that Victoria does not have a night-time restriction on novice car drivers either, so it is understandable that there was little support for one for novice motorcyclists.

Recommendation: Night time curfews for novice drivers have been enacted in South Australia without a marked loss of mobility, and initial results are suggestive of a decline in night time crashes among this group. Currently, riders with an R Date licence who are under 25 years of age, and who are without a car licence or only hold a P1 car licence, are prohibited from riding between midnight and 5am. This restriction would ideally be expanded to include all riders without a full motorcycle licence. However, as the car GLS specifies only those under the age of 25, it would arguably be inequitable to apply the motorcycle night restrictions to riders of all ages. However, it should be applied to all appropriately aged riders with an R Date licence regardless of other licences held. It should also be applied to all riders with a learner permit, regardless of other licences held and regardless of age.

2.9 Zero Blood Alcohol Concentration

The suggested requirement for a zero blood alcohol concentration (BAC) for novice motorcyclists is a recognition of the deleterious effect of alcohol on many skills required for safe riding. Incorporating this requirement into a GLS would allow motorcyclists to acquire experience without the risks associated with alcohol impairment. Motorists who hold a full (unrestricted) car licence and R Date class are currently allowed to ride with less than 0.05 BAC. Numerous studies have found that alcohol is a common contributor to motorcycle crashes, in many cases to a greater extent than crashes for other vehicle types (Haworth, Rowden, Wishart, Buckley & Watson, 2012; Johnson, Brooks & Savage, 2008; Lin & Kraus, 2009; Moskal et al., 2012; National Highway Traffic Administration, 2016; Soderstrom, Dischinger, Ho & Soderstrom, 1993). For example, the study by Moskal et al. (2012) used French crash data from 1996 to 2005 and found that the odds of being responsible for a crash increase in a dose-response manner with increasing BAC. The often cited MAIDS study in Europe found an elevated risk of crashing when under the influence of alcohol (ACEM, 2009).

Only South Australia, Western Australia and Northern Territory do not require a zero BAC for novice riders irrespective of other licences held. All other Australian jurisdictions require a zero BAC for those with a restricted motorcycle licence.

The new motorcycle GLS in Victoria requires a zero BAC for all novice riders (Senserrick et al., 2015). Such a requirement was also one of the suggestions put forward in a recent Discussion Paper for motorcycle licensing by the SA Department of Planning, Transport and Infrastructure (DPTI, 2012).

The requirement to have a zero blood alcohol concentration currently applies in South Australia to all drivers without a full car licence, as well as the drivers of particular classes of vehicle: taxis, buses, and heavy vehicles. In the case of the latter vehicle types, the aim is clear: to minimise risk as much as possible. Given the known high crash risk of motorcyclists, a zero BAC for those within the GLS is recommended.

Recommendation: There is a strong relationship between alcohol consumption and crash involvement among motorcyclists, and a zero BAC when riding a motorcycle is a requirement as part of the GLS in the majority of Australian jurisdictions. Therefore, it is recommended that all riders with a learner permit or R-Date licence, irrespective of other licences held, must have a zero BAC when riding.

2.10 No Towing of Trailers

Christie (Austroads, 2014) argues that towing of trailers is likely to confer additional risk on an inexperienced, novice rider and should be disallowed. VicRoads (2010) report that there is very little research on the risk of this activity but the report argues that towing would place 'additional demands' on novices. Christie (Austroads, 2014, p27) says that such demands mean that a 'first principles approach' suggests that towing should be prohibited for novice riders.

The new Victorian motorcycle GLS specifies that riders with a learner permit and those with a P1 licence are not permitted to tow a trailer. Towing restrictions also apply in the ACT, New South Wales and New Zealand.

Christie (Austroads, 2014) claims that very few riders, even on a full licence, tow trailers using their motorcycle so any disadvantage to novice motorcyclists is likely to be very minor.

Recommendation: Given that towing may increase risk for novice riders and that few riders would be negatively affected by prohibition of towing, is recommended that a towing restriction be put in place for riders with a learner permit. It would be reasonable to permit towing for riders with an R-Date licence.

2.11 No Use of Mobile Phones or Other Communication Devices

In many jurisdictions (including South Australia), car drivers without a full licence are not allowed even to use hands-free mobile phones while driving. This is in recognition of the well-established finding that mobile phone use or the use of other similar communication devices can interfere with the safe performance of the driving or riding task. Impairments in performance of driving or driving-related tasks have been found for hand-held phones (Caird et al., 2008, Ishigami & Klein, 2009), hands-free phones (Caird et al., 2008, Charlton, 2009, Drews, Pasupathi & Strayer, 2008, Ishigami & Klein, 2009, Leung, Croft, Jackson, Howard, & McKenzie, 2012) and texting (Drews, Yazdani, Godfrey, Cooper & Strayer, 2009; Hosking, Young & Regan, 2009, Leung et al., 2012; Owens, McLaughlin & Sudweeks, 2011).

The new Victorian motorcycle GLS does not allow mobile phone use of any sort by novice riders (Senserrick et al., 2015). Restrictions are also in place in Tasmania and Northern Territory.

Recommendation: Mobile phone use, whether hand-held or hands-free, is known to impair driving-related tasks. All phone use while driving has therefore been prohibited for novice car drivers within the South Australian GLS. This should be extended to all novice riders (learners and R Date) within the motorcycle GLS, irrespective of other licences held.

2.12 Lower demerit point threshold for licence disqualification

Similarly to the suggested requirement of a clean record for graduation to the next phase of the GLS (Section 2.4), the specification of a lower demerit point threshold for licence disqualification is aimed at increasing compliance with road laws and licence conditions. Currently, South Australia requires fewer than 4 demerit points during the learner phase. Lower demerit point thresholds also apply in New South Wales, Northern Territory, Queensland, Tasmania and Victoria. Some jurisdictions with long minimum tenure periods specify limits per year and per three years (e.g. Victoria and Tasmania).

However, a lower demerit point threshold does not apply to the R Date licence in South Australia if the rider already holds a full Class C car licence. This is because, as noted earlier in Section 2.1, the R Date Licence is really just an additional licence 'class' added to the existing full Class C car licence. The rider

has the full 12 demerit points of the full car licence available to them when riding. This is not the case when holding a learner permit for a motorcycle. If the licence holder commits an offence that results in four or more demerit points, the licence is disqualified unless SAPOL confirm that the offence was committed when driving a car rather than riding a motorcycle. If it was committed when driving a car, the disqualification notice is withdrawn. If committed when riding a motorcycle, the learner permit is subject to disqualification but the car licence remains unaffected. That this requirement applies to the learner permit is set out in legislation, specifically in the *Motor Vehicles Act 1959*, Section 81B (4) (Department of Planning Transport and Infrastructure, personal communication, November 2017). In order for the lower demerit point limit to apply to those with an R Date class added to their full Class C car licence, there would need to be a change to this legislation. The R Date licence class would have to be treated similarly to the Heavy Vehicle licence class, whereby offences that apply to that particular class can result in the cancellation of privileges to drive/ride that particular type of vehicle.

If the lower demerit point limit were applied to the R Date licence, then consideration would need to be given to an appropriate limit given any minimum tenure required with this licence class. That is, if a longer tenure during the R Date phase were introduced according to the recommendation in Section 2.3 above, then it may be appropriate to increase the demerit point limit above only four points, the models used in Victoria and Tasmania may be instructive.

Recommendation: It is recommended that the lower demerit point thresholds that are applied in the learner phase also be applied when the rider holds an R Date licence. However, if a minimum three year tenure is required for R Date licences, then consideration should be given to demerit point limits per year rather than across the entire tenure of the R Date phase.

2.13 Automatic transmission restriction for novice riders

Riding a motorcycle is more complex than driving a car. Coordinating the release of the clutch and throttle makes riding a manual motorcycle more complicated than riding an automatic as it requires additional mental effort, which could remove cognitive resources from the task of attending to, and responding to, the road and traffic environment. Christie (Austroads, 2014, p28) suggested that restricting novice riders to an automatic transmission if they learnt to ride on a motorcycle with an automatic transmission “appears prudent”.

A recent OECD working group, in its set of recommendations for novice rider testing, recommended that any testing undertaken as part of a GLS should be in accordance with the motorcycle that the applicants will be authorised to ride (OECD, 2015, p99). This effectively accomplishes the same objective, as riders would need to demonstrate competence on a manual motorcycle before being licensed to ride one.

The new Victorian motorcycle GLS requires that novice riders (learner and restricted phase) must only ride automatic motorcycles if they were tested on an automatic motorcycle (Senserrick et al., 2015). Similar requirements apply for the learner phase in Western Australia, the ACT, New South Wales, and Tasmania, and in the intermediate (restricted) phase for these jurisdictions, plus Queensland and New Zealand.

Recommendation: There is a sound theoretical basis for requiring that a rider demonstrate competency on a manual motorcycle before being licensed to ride one. South Australia should adopt the restriction to an automatic motorcycle if tested on one that applies in the majority of other jurisdictions in Australia. This should be the case for both the learner permit and R-Date licence.

2.14 Enhanced visibility requirements

A study conducted in New Zealand by Wells et al (2004) found that riders wearing highly conspicuous clothing had a 37% lower risk of being in an injury crash than other riders. There is now widespread recognition of the desirability of motorcyclists wearing high visibility clothing. Christie (Austroads, 2014) argues that requiring novice riders to wear high visibility clothing would be in accordance with similar requirements for emergency service personnel and roadside workers in various occupations. Ideally, if novice riders get used to wearing high visibility clothing, they may continue to do so when they have graduated to a full licence.

In Victoria, high visibility clothing has now been mandated for motorcyclists with a learner permit (Senserrick et al., 2015). This was viewed by the motorcycling community as one of the most contentious aspects of the new Victorian GLS. Some argue that such a requirement encroaches on riders' personal liberties. It has also been argued that riders may get a false sense of security, assuming they have been seen, and cease to apply sufficient caution in regard to planning for possible actions by other motorists. Furthermore, the evidence for high visibility clothing cited above (Wells et al., 2004) was a case control study, which necessarily did not involve random assignment to the two groups. That is, riders wearing high visibility clothing were those who had chosen to do so, and these may have been a more cautious and safe set of riders.

Recommendation: Requiring learner riders to wear high visibility clothing should provide a benefit not only in aiding conspicuity but also would alert other motorists to the inexperienced nature of the rider. As such riders are likely to still be learning road craft (including positioning), their feeling complacent about their visibility is less likely. South Australia should follow the lead of Victoria and require that motorcyclists with a learner permit wear high visibility clothing when riding.

2.15 Mandatory protective clothing requirements

Helmet wearing is mandatory in Australia but riders can otherwise choose the level of protection they wear on other parts of their body. Protective clothing for motorcyclists can include jackets, specially designed pants, gloves, boots, and full body protective outfits.

There has been considerable research into the use of protective clothing by motorcyclists in recent years (Albanese et al., 2017; de Rome & Brown, 2016; Hurren, de Rome, Nuthula & Wang, 2016; Meredith, Clarke, Fitzharris, Baldock, de Rome & Brown, 2015). There is now widespread recognition of the capacity for protective clothing to reduce injury severity among crash-involved motorcyclists. Given the higher crash risk of novice riders, it would be ideal if the rates of wearing protective clothing were maximised in this group.

In order to facilitate selection of appropriate protective clothing for riders, there is a need for the establishment of a rating system for such clothing. There is current work directed at this goal but considerable further work is required. It would be problematic to mandate that motorcyclists wear protective clothing without being able to direct them to specific products. As part of the development of the new Victorian GLS, consideration was given to mandating the use of protective clothing (VicRoads, 2010) but such a requirement was not included in the final model.

Recommendation: The use of protective clothing is a proven countermeasure for particular types of injury and its wider use by motorcyclists would be likely to have a benefit for road safety outcomes. However, the rating of the protective benefit of particular articles of motorcycle clothing has yet to be established and such guidance for choosing protective clothing would be essential for the effective operation of a mandatory system. Therefore, mandating the use of protective clothing at this time cannot

be recommended, although developments in this field need to be monitored so that such a requirement can be introduced in the future.

2.16 Power to weight ratio/Learner Approved Motorcycle Scheme

All jurisdictions in Australia, and New Zealand, impose limits on power to weight ratio for motorcycles ridden by novice riders. This is termed the Learner Approved Motorcycle Scheme (LAMS). The LAMS was introduced in South Australia in 2005. There is a national list of approved motorcycles that South Australia conforms with, and the specified power to weight ratio governing the list is 150 kilowatts per tonne. Most motorcycles with an engine capacity of less than 260cc and all motorcycles built before 1960 with an engine capacity of less than 660cc are approved under the scheme, as are all electric powered motorcycles.

Excluded from the list are motorcycles built after 1960 with an engine capacity of 660cc, other motorcycles with a power to weight ratio of more than 150kw/t, and a small number of other particular motorcycles identified as high risk. Riders who modify a LAMS approved motorcycle in such a way that its power to weight ratio is increased render the motorcycle non-compliant.

Western Australia was the jurisdiction that most recently adopted LAMS for novice riders (2010), while the new Victorian motorcycle GLS has retained the LAMS (Senserrick et al., 2015). In regards to evaluation of the scheme, the best evidence comes from an analysis of Compulsory Third Party claims data in Queensland, which revealed that the claims costs per LAMS motorcycle are considerably lower than those per non-LAMS motorcycle, based on the average claims cost per crash and the risk of being involved in a crash (Haworth & Debnath, 2014). It is also well-established that sports motorcycles, which typically have a high power to weight ratio, are associated with a higher crash risk than other motorcycle types (Brown, Baldock, Albanese, Meredith & Fitzharris, 2015; Morris, 2009; Teoh & Campbell, 2010).

Recommendation: The LAMS has been in operation in South Australia for over 10 years and is in use in every jurisdiction in Australia, as well as New Zealand. It is recommended that LAMS be retained in South Australia.

2.17 Moped requirements

Mopeds are low-powered scooters with an engine capacity not exceeding 50cc. In South Australia, similar to many other jurisdictions, it is permissible for people to ride mopeds if they have a car licence. Christie (Austroads, 2014) argues that those wishing to ride mopeds should either hold a specific moped licence or should hold a motorcycle licence. This is in recognition of the fact that mopeds handle like motorcycles not cars, that the types of risks and hazards moped riders are exposed to resemble those of motorcycles, and that the crash risk and rates associated with mopeds are higher than those associated with cars. Requiring those who wish to ride a moped to be trained in riding was one of the suggestions put forward in a recent Discussion Paper for motorcycle licensing by the SA Department of Planning, Transport and Infrastructure (DPTI, 2012).

Blackman and Haworth (2013) analysed five years of police reported crash data in Queensland and found similar crash rates per registered vehicle for motorcycles, scooters and mopeds. However, when crash rates were assessed on a per distance travelled basis, mopeds had four times the crash rate of the other two types of powered two wheelers. In regards to injury severity, motorcycle crashes were associated with more severe injuries, which was due to the circumstances in which riding was done (e.g. more high speed roads) rather than any inherent effect of the vehicle types.

In regard to licensing, a study conducted in Spain (Perez et al., 2009) assessed the effect of a law change in 2004 that allowed car licence holders to ride a light motorcycle (< 125cc) without a specific motorcycle licence. It was found that the number of traffic injuries increased.

The requirement for a specific moped licence or a motorcycle licence would mean that those wishing to ride mopeds would need to complete any training programs required of novice motorcyclists, and would be subject to the same licence restrictions as novice motorcyclists as they progress through the GLS.

Along with South Australia, Western Australia, Queensland and Northern Territory also currently allow moped operation on a car licence. In Victoria, New South Wales, the Australian Capital Territory and Tasmania, a motorcycle licence is required to ride a moped.

Recommendation: In light of the high crash rates per distance travelled with mopeds and the fact that mopeds are exposed to similar risks in traffic to motorcycles, it is recommended that riding a moped without a motorcycle licence in South Australia be prohibited. Those wishing to ride a moped would have to progress through the motorcycle GLS in the same way as those wishing to ride a scooter or motorcycle.

2.18 Novice rider testing

Christie (Austroads, 2014) advocates that riders be subjected to competency based skills assessment before being allowed to ride on road. In support of this, it is noted that US research has found that states with a rider skill test at learner level have fewer motorcycle fatalities (McGwin et al., 2004). Christie also argues that riders should complete a knowledge test in which they answer questions about safe riding, motorcycle specific road laws and crash or injury risks for motorcyclists.

An OECD report noted that most US jurisdictions use an off-road skill test, while an EU Directive (2006/126/EC) specifies a theoretical test, a special manoeuvres off-road test and an on-road test. An OECD Working Group recommended an assessment of technical driving skills off-road and an assessment of traffic skills on-road (OECD, 2015).

South Australia currently has theoretical and off-road testing to obtain a learner permit and be permitted to ride on the road. This is similar to other jurisdictions in Australia except Queensland and Western Australia where there is supervised on-road riding during the learner phase. Victoria has recently introduced an on-road component as part of their novice rider assessment.

Recommendation: There is a trend towards the requirement for demonstration of riding skills on a road before a rider is permitted to ride on-road unsupervised. This requirement has been recommended by the EU and OECD, and has been adopted in Victoria. South Australia currently requires a demonstration of motorcycling handling abilities off-road. It is recommended that an on-road testing component is added to this. The Victorian test could potentially provide a model for this.

3 GLS elements that Christie (Austroads, 2014) advised needed more research

3.1 Exit test for novice riders

This refers to the testing of riders after completion of the required period in the intermediate phase, before riders are permitted to graduate to an unrestricted licence. The aim of such testing is to screen novices before they graduate to a full licence, and should motivate riders to gain more skills and experience in the restricted phase. Christie (Austroads, 2014) reports that there is no evidence to support a crash reduction benefit from exit testing, but argues that there may be an exposure reduction benefit.

An exit test has been included in the new Victorian motorcycle GLS. It involves an off-road assessment of basic skills and an on-road assessment of observation skills, safe speed choice and lane positioning. Exit tests also exist in Western Australia, Queensland, Tasmania, and the Northern Territory.

Such exit tests could be beneficial but are perhaps of less utility in a GLS that already incorporates mandatory training, requires testing prior to a learner permit and before progression to the restricted phase, and which mandates a long period of riding under restricted conditions. If South Australia adopts the longer minimum tenure for the restricted phase of three years, as advocated in Section 2.3, then riders should have acquired considerable on-road experience at relatively low risk and should be able to progress automatically to a full licence.

One potential option would be to retain the restriction of a LAMS motorcycle even after three years with an R Date licence, until the rider can pass a practical riding assessment on a non-LAMS motorcycle. Although intuitively appealing, it is problematic in that it would appear unfair to ask a rider to pass a practical riding assessment on a motorcycle that they are not legally permitted to practise riding on the road.

Recommendation: South Australia currently does not require riders to undertake an exit test before graduating from an R Date to a full, unrestricted motorcycle licence. The arguments in favour of introducing an exit test are largely theoretical in nature: ensuring that riders have gained sufficient experience during the restricted phase to develop a larger skill set for riding without restrictions. It may be that evidence from the evaluation of the new Victorian GLS will provide guidance as to whether the addition of an exit test has benefits. However, at this stage, it is recommended that South Australia retain the automatic progression from an R Date to a full licence if the minimum tenure of the R Date phase is increased to three years.

3.2 Hazard Perception Test (HPT) for novice riders

A number of Australian jurisdictions use a Hazard Perception Test within their GLS for car drivers. These computer-administered tests assess the driver's ability to detect hazards in the road and traffic environment in a timely fashion and respond to them appropriately. Hazard perception reaction times have been found to be longer for crash-prone drivers (McKenna & Crick, 1991; McKenna & Horswill, 1999; Quimby, Maycock, Dixon & Wall, 1986) while Drummond (2000) found in a prospective study that long hazard perception reaction times were associated with a higher risk of a fatal crash in the first year of solo driving. Similarly, Boufous, Ivers, Senserrick & Stevenson (2011) found that learner drivers who failed the HPT twice, as part of the GLS in New South Wales, had an increased risk of involvement in a road crash compared to those who passed the test on the first attempt.

No jurisdictions, however, currently have a motorcycle-specific HPT. The new Victorian motorcycle GLS requires completion of the car-based HPT if the rider does not have a car licence. Wallace, Haworth and Regan (2005) noted that car-based HPTs are unlikely to be suitable for motorcyclists.

Indeed, research undertaken by CASR for Austroads found that motorcyclist crash patterns and the hazards associated with them differ from novice car drivers. A motorcycle-specific HPT has now been developed by CASR on behalf of Austroads, so it may be possible to use that HPT in a motorcycle GLS. The Austroads project resulted in the development of a new car HPT also, which has already been adopted as part of the car GLS in Western Australia.

For novice car drivers in South Australia, the HPT must be completed prior to obtaining a P1 provisional licence. If the Motorcycle HPT is to be adopted as part of the motorcycle GLS, it would ideally be administered at the same point in the GLS: when the rider is attempting to progress from a learner permit to an R-Date licence. However, in the case of motorcycling, riding on-road without supervision first occurs with a learner permit. Therefore, for motorcyclists, the HPT should be administered earlier in the GLS, prior to the novice rider being granted a learner permit.

Recommendation: Motorcyclists should be required to complete the new Austroads Motorcycle HPT as part of the GLS in order to qualify for a learner permit. This should apply regardless of any car licence already held by the rider and regardless of whether the rider has already completed the Car HPT.

3.3 Risk-based screening tests

While a HPT provides a measurement of a performance capacity, it is also possible to develop measures of riders' behavioural intentions. If such a measure identifies a rider with a high propensity for risk-taking then the rider may be directed into some kind of additional educational intervention that addresses the attitudinal and motivational factors supporting dangerous riding behaviour.

One issue with such an approach is that those sitting a risk-based screening test may be able to determine the appropriate answers to give to pass the test. In contrast to a performance based test like the HPT, it may be possible to pass an attitude or self-reported behaviour test by giving false answers.

Even if it is possible to design a test instrument that is difficult to pass by lying, there still needs to be a subsequent educational intervention that high risk prospective riders can undertake in order to address their attitudinal risk factors.

Rowden, Watson, Wishart and Schonfeld (2009) trialled an attitudinal and risk taking intervention as part of a training program for novice riders in Queensland. The intervention involved a one hour classroom based session and a 20 minute debrief to revise the concepts at the end of training. Follow-up assessments (conducted on only a small sub-sample of those who experienced the intervention) suggested internalisation of the concepts by inexperienced riders but less success with more experienced riders. The latter group claimed the content of the intervention was all common sense and yet displayed riding styles contrary to the intervention messages. The authors suggested (p291) that the intervention "may not have challenged pre-existing beliefs about risk taking. Overall it appears that the pilot intervention was successful in raising awareness of risk factors, however its affect [sic] in regard to actual behaviour change remains unclear."

Recommendation: It may be difficult to design a suitable risk-based screening test and even if one could be developed, there is limited evidence for a benefit related to risk based training programs beyond discussions of attitudes, motivations and risks during standard training. A risk based screening test should not be included in a South Australian motorcycle GLS.

4 GLS elements that Christie (Austroads, 2014) advised against

4.1 On-road supervision of learner riders

Christie (Austroads, 2014) argued that on-road supervision of learner riders has not been shown to be beneficial. He also argued that it is dangerous. This danger is related to distraction for both the novice and the supervisor. The novice needs to take note of the supervisor and respond to their directions, which could distract from the primary driving task. Similarly, the supervisor will need to monitor the novice and so will themselves also be distracted from the primary task of riding, which could increase risk. Christie also argues that the use of two-way radio or phone communication while riding would be distracting. He suggests that novice riders consolidate skills through the accumulation of on-road experience in restricted conditions before undertaking exit tests before the next phase of the GLS.

A counter-argument in support of the on-road supervision of learner riders is that the first time learners ride on a public road, they are doing so by themselves. Having someone supervising at least some of their early on-road riding would provide some degree of support and guidance. The argument is, effectively, not that on-road supervision is an effective tool for improving riding outcomes but that it is better than letting very inexperienced motorcyclists ride alone in traffic on public roads.

Supervision of learner riders is undertaken in Queensland, with the supervisor following a distance behind the novice, either on a motorcycle or in a car. It is also undertaken in Western Australia, where the supervisor can ride as a pillion passenger, or in a sidecar, or on another motorcycle. It is noteworthy, however, that neither of these jurisdictions require pre-learner training or a practical riding assessment prior to obtaining a learner permit. In South Australia, riders must undertake a mandatory training course (Rider Safe) and then demonstrate basic riding competency prior to obtaining a learner permit and riding on public roads.

Recommendation: On-road supervision of all learner riders is potentially dangerous through increases in riding exposure and rider distraction, both for the novice and the supervisor. Riders in South Australia already need to demonstrate basic competency prior to riding on public roads with a learner permit. It is recommended that South Australia does not require supervision of learner riders.

4.2 On-road coaching or mentoring of novice riders

Coaching of novice riders is different to training. Training is instruction in generic skills. Coaching involves programs that are tailored to the individual to facilitate improved task performance. Usually coaching involves riding with the coach, and stopping periodically for feedback or mentoring.

The new Victorian motorcycle GLS includes a coaching program called 'Check Ride'. This involves an off-road review of the novice's braking, steering and low speed manoeuvring skills, and an on-road group ride (up to 5 participants) riding on a route that incorporates multi-lane highways, narrow country roads, shopping centres, and hills and bends. An instructor gives each rider feedback on how they can reduce their risk of crashing. The Check Ride needs to be undertaken at least one month prior to going for a full motorcycle licence.

A large scale trial of on-road coaching for *newly licensed* riders has recently been completed by VicRoads. This trial involved the random allocation of 2400 newly licensed riders to either an intervention or control group. The intervention group received a coaching session and facilitated discussion in small groups with a riding coach. Follow-up occurred after 3 months and 12 months, comparing the intervention group to the control group on measures of police-reported and self-reported crashes, as well as offences, riding exposure and riding behaviours and motivations. The result was no difference

between the two groups in terms of crashes but the intervention group reported more speeding behaviour, riding confidence and riding exposure (Ivers, Sakashita, Senserrick, Elkington, Lo, Boufous & De Rome, 2016). The authors of the evaluation described the outcome as being consistent with rider training literature and with driver training literature that has failed to find an effect of post-licence training on crash risk. Furthermore, they argued that increased riding exposure combined with greater self-reported speeding behaviour could lead to a higher crash risk. The conclusion of the evaluation was (p46): “Given the absence of road safety benefits of rider training, and the substantial challenges in implementing state wide programs, rider training should be considered a less promising strategy than other aspects of a safe system approach.”

An additional lesson from the VicRoads trial was the difficulty in recruiting newly-licensed riders to participate. This lack of interest is suggestive of likely issues with running any voluntary post-licence educational programs. Sakashita et al. (2015) stated that “barriers to... program attendance may also reflect that individualised programs such as VicRide are practically challenging to standardise and implement as a state-wide intervention.”

Ulleberg (2003), cited in OECD (2015), used a meta-analysis to examine post-licence training. It was found that riders often felt more competent and overconfident after course completion despite not substantially improving their skills or having improved skills that are not focused on crash-prevention.

A contrary finding has emerged from a trial run in the Netherlands of an advanced rider training course called ‘Risk’. This program is focused on teaching the timely perception and recognition of traffic hazards, rather than the acquisition of riding skills. Specifically, it goes through five steps of hazard perception: (1) insight into one’s own limitations, (2) perceiving possible hazards, (3) judging whether riding behaviour should be adapted, (4) choosing rider behaviour, and (5) performing riding behaviour. The program is run with small groups of no more than nine riders. Steps 1 to 3 are addressed in the morning, followed by a group ride on a public road, discussion of steps 4 to 5, and then another group ride. An evaluation by Boele-Vos and de Craen (2015) found improved road positioning in an on-road assessment and improved performance on a hazard perception test, although the fact that riders were assessed by the course instructors is methodologically problematic.

Recommendation: This is a rare case in which considerable effort has been undertaken to evaluate the effectiveness of a potential component of a GLS. The findings of the evaluation of the VicRoads on-road coaching trial suggest that on-road coaching or mentoring of newly licensed riders should not be included in a GLS. However, the new Victorian GLS includes coaching of riders with an intermediate licence. It is possible that a compulsory program undertaken with less experienced riders is more effective. Nonetheless, the lack of promising findings in general for on-road coaching make it difficult to support its presence in a GLS. It would be prudent to monitor the outcomes of the Victorian GLS, particularly any that can be related to the on-road coaching component, to allow for consideration at a later date.

4.3 Mandatory rider training

In considering the provision of mandatory rider training as part of a GLS, Christie (Austroads, 2014) refers to the Cochrane Collaboration review by Kardamanidis et al. (2010), which failed to find good evidence of an effect of training on subsequent crash, injury or offence rates. At most, rider training was thought to reduce motorcycle crashes through being an impediment to obtaining a licence, and therefore causing a reduction in exposure.

In the US and Canada, rider training is mostly voluntary. In Canada, emphasis is placed on rider awareness and communicating the inherent risk of motorcycling. In the US, entry level training is common but there is very little use of on-road training. In Europe, training focuses on the operational

and tactical levels of driving/riding but less emphasis is placed on the strategic (e.g. route selection) and general (personal characteristics) levels (OECD, 2015). A working group set up by the OECD recommended that training should put an emphasis on defensive riding, equipping the rider with the ability to foresee the riskiest potential scenario at any moment and to be prepared to cope with that situation if it should occur (OECD, 2015). Haworth and Rowden (2010) argue that such training should cover attitudinal and motivational issues, with continued reinforcement of this through training during the provisional (or intermediate) licence phase.

The new Victorian motorcycle GLS includes a mandatory training course, which was not previously required in Victoria. The course lasts for two days and includes training in basic skills and road craft. Riders are required to undertake both off and on-road assessments, as well as a pen and paper knowledge test. Prior to the new GLS, pre-learner training in Victoria was voluntary but, as around 95 per cent of riders would undertake voluntary training, it was not controversial to make it mandatory. A number of Australian jurisdictions have some form of mandatory pre-learner training, although there is currently no such requirement in Western Australia, Queensland or the Northern Territory. It is believed to be under consideration, however, in both WA and Queensland.

Recommendation: The experience in Victoria suggests an appetite for pre-learner training among nearly all novice motorcyclists and having a competency assessment prior to riding on the road is consistent with the need for training. By making such training mandatory, it is possible to control the training curriculum, structure and duration, and ensure that all riders are receiving uniform safety messages and equivalent instruction in skills. Such training should include an emphasis also on attitudinal and motivational issues, and control of risk. South Australia already has mandatory pre-learner training and it is recommended that it be retained.

5 Summary and conclusions

Motorcyclists continue to account for a considerable proportion of South Australia's road trauma. From 2012 to 2016, motorcyclists comprised 17% of serious injuries and 12% of fatalities. Younger riders are over-represented in these crashes in terms of motorcycle licence and registration numbers (DPTI, 2017). At the time of writing, the number of motorcyclist fatalities in 2017 in South Australia is double the average for 2012 to 2016.

One countermeasure that has been successful in reducing the risk of crashes among novice drivers is the Graduated Licensing System (GLS). GLS work by imposing restrictions on novice drivers and gradually lifting them as the drivers progress through the different phases of the system. In this way, driving experience is obtained initially in conditions of low risk, with more challenging conditions only encountered once a driver has reached a particular level of experience and maturity. Considerable effort has been directed into the development of GLS for car drivers in recent years, and most jurisdictions are now looking at strengthening or enhancing their motorcycle GLS.

The present report uses as its starting point an Austroads report on a GLS for motorcyclists by Dr Ron Christie (Austroads, 2014). Ron Christie was one of Australia's most eminent road safety experts and his Austroads report provides a comprehensive inventory of all possible elements that could be incorporated into a motorcycle GLS. South Australia has been monitoring GLS developments in other jurisdictions with a view to implementing best practice initiatives. In the present report, in Section 2, consideration is given to the elements that Christie recommended for a motorcycle GLS. In Section 3, consideration is given to elements that Christie argued needed more research before a recommendation could be made. Section 4 provides consideration of elements that Christie advised against including in a GLS. Section 5 lists recommendations based on the preceding sections. For each possible GLS component discussed in the report, consideration is given to the following:

- Christie's (Austroads, 2014) recommendations,
- whether or not South Australia already incorporates the element in its current GLS,
- other research findings related to crash risks or related countermeasures,
- best practice models for graduated licensing,
- GLS in other jurisdictions
- and the components chosen for the Victorian GLS (the most recently restructured motorcycle GLS in Australia).

On the basis of these considerations, a number of recommendations can be made regarding a potential motorcycle GLS for South Australia. These recommendations can be summarised in the model presented in Table 1b, with the current GLS shown above it in Table 1a.

Table 1a: The current South Australian motorcycle GLS

STEP 1 Pre-learner	STEP 2 Learner permit R-Date endorsement	STEP 3 R-Date licence endorsement	STEP 4 R class licence endorsement	STEP 5 Full unrestricted R class licence
Minimum age 16 Pass the theory test (not required if already holds a driver's licence) Pass Basic Rider Safe Course	Minimum age 16 LAMS restricted Zero alcohol/drugs Pass Advanced Rider Safe course Pass Hazard Perception Test (not required if already holds a driver's licence) No pillion passenger unless a Qualified Supervising Driver If no driver's licence already, must hold learners permit for at least 12 months or 6 months if over 25.	Minimum age 17 LAMS restricted Hold R-Date for at least 12 months Subject to provisional P1 conditions (not required if already holds an unrestricted driver's licence)	Minimum age 18 No LAMS restrictions (period on provisional licence for those without a full car licence)	Minimum age 20

Table 1b: The proposed South Australian motorcycle GLS

STEP 1 Pre-learner	STEP 2 Learner permit R-Date endorsement	STEP 3 R-Date licence endorsement	STEP 4 Full unrestricted R class licence
Minimum age 18 Pass the theory test (not required if already holds a driver's licence) Pass the Motorcycle Hazard Perception Test Pass Basic Rider Safe Course	Minimum age 18 LAMS restricted Zero alcohol/drugs No pillion passenger Wear L plates Wear high visibility vest No towing Night curfew no phone use while riding automatic motorcycle if tested on one Must hold learners permit for at least 6 months. Pass Advanced Rider Safe course	Minimum age 18 yrs 6 months LAMS restricted Zero alcohol/drugs No pillion passenger No towing Night curfew if under 25 no phone use while riding automatic motorcycle if tested on one Hold R-Date for at least 3 years	Minimum age 21 yrs 6 months

As can be seen in Table 1b, there are a number of restrictions that apply to riders in both novice phases of the GLS, including a LAMS motorcycle, zero BAC, no pillion passengers, no phone use while riding, an automatic motorcycle if tested on one, and a lower demerit point threshold than applies to a full licence. There is also a much longer timespan over which the GLS operates, meaning that these restrictions are in place for a longer time, allowing considerable riding experience to be gained in low risk conditions.

In terms of progression from the learner phase to the R Date licence class, the night time curfew that applies to all learner riders only applies to riders under the age of 25, and the requirement for displaying L plates, the requirement to wear high visibility clothing, and the prohibition of towing are removed. This means that two of the more 'restrictive' conditions (high visibility clothing, night curfew) will, for most riders, only apply in the learner permit phase. These, however, will likely aid rider safety considerably while they accumulate sufficient on-road riding skills to pass the Rider Safe Advanced Course. The six months of riding with high visibility clothing may mean that riders get used to wearing such attire and continue to do so beyond the learner permit phase.

5.1 Other countermeasures

It also should be emphasised that, while a motorcycle GLS will be beneficial for novice motorcyclists and should contribute to a safer cohort of fully licensed riders once they have successfully completed the GLS, there are other countermeasures that will continue to be crucial for improving motorcyclist safety in South Australia. These include countermeasures related to infrastructure, vehicle technology, enforcement and protective clothing.

5.1.1 Infrastructure

A recent review for Austroads (2016) identified a range of road-related issues that could increase the crash risk of motorcyclists: lane width, shoulder width (sealed), curve type and radius, horizontal and vertical sight distances, the condition of the road surface (i.e. deterioration, deformation), objects on the road surface (i.e. service covers, debris), surface texture, drainage of the road surface, signage, delineation, and curve quality (i.e. curve warning signs, chevron alignment markers). Almost all roadside objects can be hazardous for motorcyclists and some "roadside objects that have been designed to provide safer performance for passenger vehicles do not always provide a safety function to motorcyclists" (Austroads, 2016, p205).

The report suggests a number of road infrastructure based crash mitigation measures. These measures are presented separately for the two broad types of crashes involving motorcyclists: loss of control crashes on curves (single vehicle or head on), and multiple vehicle collisions at junctions. For single vehicle crashes, the authors suggest "improvements to the road surface (in particular re-surfacing) on curves, curve approaches and departures; improving and maintaining delineation and curve warning/quality signage" (p205). They also indicated support for lane widening and sealed shoulder widening on curves, and wide centre lines. For intersections, the best countermeasures were nominated to be providing sightlines at intersections to allow for safe intersection sight distances, separating movements at signalised intersections with designated right turn lanes, and protecting turning motorcycles with channelised right and auxiliary left turn lanes. If safe intersection sight distances cannot be provided, then alternative treatments could be applied, such as warning signs, intersection ahead pavement markings or vehicle activated signs (Austroads, 2016).

The report also argued that a proactive approach is best. This means the use of assessment tools such as the Australian National Risk Assessment Model (ANRAM), the Australian Road Assessment Program (AusRAP) or the International Road Assessment Program (iRAP). The report includes an example of

applying an AusRAP assessment to a 35km long section of road in South Australia. The authors reported benefit cost ratios of between 2 and 12 for various treatments including improved skid resistance and road condition, improved delineation and curve delineation/quality, improved sight distances, sealed shoulder widening, lane widening, providing motorcycle safety barriers, and clearing roadside hazards (Austroads, 2016).

DPTI has put considerable effort in recent years to provide infrastructure treatments on routes frequented by motorcyclists. This has been done in consultation with the Motorcycle Reference Group, which includes representation from road safety bodies, and motorcycle rider groups and stakeholders. DPTI has been particularly active in applying motorcycle barriers to existing w-beam guardrails to provide greater protection to motorcyclists in the event of run-off-road crashes on popular motorcycling routes. Since commencement of this program of works in 2014, additional barrier systems have been applied on the following roads: Barossa Valley Way, Lyndoch Valley/South Para to Chain of Ponds Rd, Tea Tree Gully to Mannum Rd, Cudlee Creek to Lobethal Rd, Aldgate to White Hill Rd, Blackwood to Goolwa Rd, Stirling to Strathalbyn Rd, Mt Barker to Strathalbyn Rd, Echunga to Meadows Rd, Main South Rd, Gawler to Kersbrook Rd, Gorge Rd, Magill to Lobethal Rd, and Burnside to Balhannah Rd. The full length of Tippett Rd is also proposed for treatment in 2018. Council blackspot funding was also used by Onkaparinga Council to install motorcycle barriers on Old Willunga Hill Rd. The application of perceptual countermeasures at difficult to treat junctions has also been trialled.

It should also be noted that many infrastructure treatments that are not motorcycle-specific are likely to have considerable benefits for motorcyclists. Examples include widespread programs of centre barrier installation and the use of Rural Intersection Activated Warning Systems (Kenn Beer, Safe System Solutions, personal communication, January 2018). The South Australian Government announced in May 2017 that Rural Intersection Activated Warning Systems would be installed at the following intersections: Bakers Gully and McLaren Flat Rds in Kangarilla, Paris Creek and Bull Creek Rds in Paris Creek, Fox Creek and Cudlee Creek Rds in Cudlee Creek, and Horrocks Highway and Stradbroke Rd in Stanley Flat. These systems, first developed in Sweden and notably used with considerable success in New Zealand, involve using electronic signs to lower the speed limit on the major road at an intersection, when a vehicle is detected approaching the intersection on the minor road.

5.1.2 Vehicle technology

In regard to vehicle technology, benefits can be expected to come from advances in both motorcycle technology and technology fitted to other vehicles. Ponte, Searson, Royals and Anderson (2015) reported that there are safety benefits for motorcyclists through greater use of combined braking systems, traction control systems and anti-lock braking systems (ABS). Concentrating on the latter technology, Ponte et al. (2015) claimed that if all motorcycles sold in South Australia in 2025 were fitted with ABS, the reduction in motorcycle crashes would be in the region of 10 to 25%.

There is also work being done internationally to assess whether autonomous emergency braking systems could be beneficial for motorcycles. Such systems are increasingly seen in new car models and are soon to be incorporated into the testing regimes of European and Australasian New Car Assessment Programs. An increasing proportion of cars fitted with AEB is likely to have safety benefits for motorcyclists. However, there remains the question of whether a motorcycle version of the technology (MAEB) could be as effective. Motorcycles are considerably more manoeuvrable and so MAEB would have to activate very close to impact (i.e. only when there is no chance to manoeuvre around the hazard, typically less than a second from impact), meaning that, at most, MAEB could reduce crash severity but not prevent crash occurrence. A recent study by Savino, Mackenzie, Allen, Baldock, Brown and Fitzharris (2016) examined the likely benefits of MAEB by taking a sample of motorcycle crashes from Australian in-depth crash investigation databases and simulating the outcomes of the

crashes had the motorcycle been fitted with variants of MAEB. Reductions in impact speeds were found to be in the range of 2.8 to 10.0 km/h with confidence intervals of around 20 per cent based on modelling levels of uncertainty in the initial crash conditions,

A key future technology-based countermeasure for multiple vehicle collisions involving motorcycles, especially crashes involving failure to give way, is likely to be vehicle-to-vehicle technology (V2V). The aim of V2V is the prevention of collisions through communication between vehicles. Bosch is currently working with Autotalks, Ducati and Adelaide-based company Cohda Wireless to develop V2V systems for motorcycles. These systems work via transmission of data through the Wireless Local Area Network (WLAN). V2V-equipped vehicles would share information about vehicle type, position, speed and direction of travel with other vehicles within a radius of several hundred metres. Drivers and riders can then be alerted to the presence of other approaching vehicles or hazards before they have seen them. Riders of motorcycles could receive audio alerts through headsets in their helmets. As so many failure-to-give-way crashes result from drivers of other vehicles failing to detect motorcycles, systems that could alert drivers to the presence of motorcyclists, or even ultimately intervene to prevent collisions with motorcycles that drivers have not seen, could potentially contribute to marked reductions in such crashes.

5.1.3 Enforcement

In regard to enforcement, speeding and unlicensed riding continue to contribute to serious and fatal motorcycle crashes (DPTI, 2017). Better training that addresses motivational issues could potentially lead to some reduction in crashes subsequent to risky behaviour but it is likely that enforcement will remain of importance to discourage speeding and riding unlicensed. It must be noted that safety for motorcyclists will be enhanced not only by enforcement of motorcyclist behaviour but also the behaviour of drivers of larger vehicles (OECD/ITF, 2015).

Research on enforcement has identified a number of principles necessary for effective deterrence of unsafe behaviours (OECD/ITF, 2015). These include:

- a mix of traditional, visible enforcement with on-the-spot roadside checks by police, and automated enforcement for offences such as speeding and red light running
- randomness of enforcement so that it is unpredictable in terms of time and location

Future prevention of unlicensed riding could involve the incorporation of licences in the ignition process. That is, in order to start the vehicle, a specially micro-chipped licence card or some other form of identification needs to be provided by an appropriately licensed rider, or perhaps even the appropriately licensed and registered owner of the vehicle. Although there have been advocates for such technology since the 1990s, there remains considerable research and development before such a system can be introduced (Baldock et al., 2013).

5.1.4 Protective clothing

Finally, in regard to protective clothing, as was noted earlier in the report (Section 2.15), there has been considerable research into the use of protective clothing by motorcyclists in recent years. There is now widespread recognition of the capacity for protective clothing to reduce injury severity among crash-involved motorcyclists. In order to facilitate the uptake of protective clothing, an independent rating scheme is needed so that consumers can make an informed choice about which items to purchase to provide good protection (de Rome, Gibson, Haworth, Ivers, Sakashita & Varnsvery, 2012). The rating scheme will need to test for the various ways in which protective clothing fails in a crash: abrasion, burst, tear, cut and impact and fastening failure (Woods, 1996).

It is important to recognise the limits of such clothing, however. At high speeds, crash impacts will often be too severe for protective clothing to prevent serious injury.

There is also a need for the development of clothing that protects the rider but which does not result in increases in body temperature in hot weather. A study by De Rome and Brown (2016) found that 90 minutes of riding climatic conditions of 35 degrees Celsius and 45 per cent humidity resulted in an increase in heart rate, increases in body core and skin temperatures, higher perceived workload, greater levels of negative affect and, in the final 30 minutes, increases in reaction time and errors on a cognitive test.

Another form of protective clothing that has been developed in recent years is the motorcycle jacket that inflates like an airbag in the event of a crash. A European standard for inflatable jackets has been established but the injury prevention capacity of such garments has yet to be determined. A challenge remains the considerable array of crash kinematics that would need to be accommodated by the crash detection system (Liz de Rome, personal communication, December 2017).

There are three types of inflatable motorcycle jacket. The first type activated by a lanyard attached to the motorcycle that activates a gas canister in the event of a rider leaving the motorcycle in a crash. The jacket remains inflated for up to 5 minutes after the deployment. A concern in regard to this type of jacket is the time for deployment. The lanyard must be fully stretched before the gas canister is activated. This would mean that the rider would need to have his or her abdomen approximately level with the handlebars before deployment occurs. This would be too late for a direct impact such as a collision in which the rider strikes the side of a car. The airbag also takes up to 0.5 of a second to expand. With this length of time to deployment, it would be expected that this type of jacket would only provide protection to a rider who leaves their motorcycle early in the crash event and subsequently impacts something later in the crash event, such as a tree or item of road furniture (Christopher Hurren, Deakin University, personal communication, January 2018).

The second type uses an accelerometer mounted within the jacket to determine if a rider is involved in a crash. The electronics attached to the accelerometer then trigger a mechanism that deploys the argon inflation canister within the garment. Only one manufacturer (Alpinestars) makes this technology due to patent protection. The maker of this technology claims a 25ms inflation time from the point of triggering, which is considerably quicker than the lanyard style jacket. An issue with this type of jacket is that they must be turned on and charged in order to work, and a short battery life of two to three hours between charges (Christopher Hurren, Deakin University, personal communication, January 2018).

The third type uses an accelerometer mounted within the jacket combined with a set of fork and under seat mounted accelerometers to determine if a crash is occurring. The electronics attached to the accelerometer, or via Bluetooth from the forks/under seat, trigger a mechanism that deploys the argon inflation canister within the garment. The maker of this technology claims a 25ms inflation time from point of triggering, which, again, is quicker than the lanyard style jacket. Only one manufacturer offers this type of jacket due to patent protection (Dainese). The deployment in this type of crash is slightly quicker than the jacket above with only a jacket-mounted accelerometer. The fork mounted sensors should improve the trigger time as they should sense a frontal collision before the jacket-mounted sensor would pick up the same event. Once again these also suffer from a short battery life and needs to be switched on before use (Christopher Hurren, Deakin University, personal communication, January 2018).

Therefore, it appears that there may be some benefit from the use of such jackets but there are still question marks over their performance in circumstances that differ from the standard ISO test (90 degree impact with a stationary car at 48 km/h). Other issues include slow deployment times for the

lanyard type jacket, and the need for recharging and a short battery life for the two other types. There are also likely to be issues for increased rider discomfort in warm weather as the airbag materials are not breathable and will trap perspiration within the garment (Christopher Hurren, Deakin University, personal communication, January 2018).

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