Graduated licensing for motorcyclists: Rationale, effectiveness, challenges and opportunities for the future

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Abstract

Graduated licensing was originally introduced as a method to address the high crash involvement of young, newly licenced drivers. It has since emerged as an attractive and logical option for reducing the incidence of crashes among novice motorcyclists. Five components of graduated licensing systems for motorcyclists were reviewed and discussed, including their rationale and any information regarding their effectiveness as crash countermeasures. The five components selected for discussion in the current paper were: (1) minimum age for obtaining a Learner’s Permit and an Intermediate Licence; (2) minimum time period for holding a Learner’s permit; (3) supervision requirements during the Learner phase; (4) blood-alcohol content restrictions; and (5) automatic transmission restrictions. The future of graduated licensing for motorcyclists, highlighting opportunities for improvement of current practices, is also discussed.

Keywords
Graduated licensing, motorcyclists, crash countermeasures, literature review, GLS

Introduction

Graduated licensing was originally introduced as a method to address the high crash involvement of young, newly licenced drivers. Graduated licensing is intended to target the key factors which contribute to young novice driver crash involvement: age and inexperience. It is a system which delays full licensure, thus providing beginners with the opportunity to first gain experience and to acquire critical driving skills under conditions of lower risk. As the novices gain maturity and experience, licensure restrictions are gradually lifted and the novices are granted the opportunity to experience and master new, more complex traffic conditions and scenarios. Eventually, all restrictions are removed and the novice is granted a full privilege licence (1-4).

The development and implementation of graduated licensing systems (GLS) by road authorities has increased over the last 10 to 15 years, primarily due to the success of graduated licensing in reducing the incidence of crashes among young novice car drivers. Traditionally, GLS comprise three phases: a supervised Learner’s period, an Intermediate (restricted) Licence that limits unsupervised driving in high-risk situations, and a Full privilege licence. GLS for car drivers are in place in all Australian states and territories, as well as in New Zealand, and most jurisdictions across the United States and Canada. It is important to recognise, nonetheless, that there is much variation across jurisdictions in the number and depth of graduated licensing measures in place, as well as in the levels of enforcement and public compliance of those measures. These differences across jurisdictions have led to discussions of which graduated licensing measures are the most effective and, therefore, which measures should be included in the “optimal” system. The optimal form of each measure is also a subject of much discussion and debate. For a recent and in-depth discussion of graduated licensing for car drivers refer Hedlund (1), Vanlaar et al. (2), Williams (3), Williams and Mayhew (4), Insurance Institute for Highway Safety (5), and Senserrick (6).

The high crash involvement of motorcyclists is well documented. In a recent report, it was noted that, while motorcycles account for 4.5 percent of all Australian passenger vehicle registrations and 0.9 percent of vehicle-kilometres travelled, motorcycle riders account for approximately 15 percent of all road fatalities and an even higher proportion of serious injuries (7). Age and inexperience also play an important role in the crashes of novice motorcycle riders (8). It is for this reason that graduated licensing for motorcyclists has been presented as an attractive and logical option for reducing the incidence of crashes among novice motorcyclists. GLS for motorcyclists are in place in all states and territories in Australia, and also in New Zealand. Several jurisdictions across North America also have some form of GLS in place for motorcyclists, although, typically, such systems are less widespread and comprehensive.
This paper presents the outcomes of a literature review which sought to explore the rationale behind five components of GLS for motorcyclists, and the potential of each of these components as crash countermeasures. The review was coupled, for each of the five components, with information on current practice for rider licensing in jurisdictions across Australia and New Zealand and, for comparative purposes, with current practice for car driver GLS (Table 1). Components included in the review were: 1) minimum age for obtaining a Learner’s Permit and an Intermediate Licence, 2) minimum time period for holding a Learner’s Permit, 3) supervision requirements during the Learner phase, 4) blood-alcohol content (BAC) restrictions, and 5) automatic transmission restrictions. Although focused on motorcycle rider graduated licensing, the review also referred to the literature into car driver GLS as appropriate. This was necessary given the paucity of research in the area of motorcycle rider GLS. Indeed, the development of GLS for motorcycle riders, relative to that for car drivers, is in its infancy. Studies exploring the effectiveness of GLS for motorcyclists are scarce and those that have been undertaken have yielded largely inconclusive findings (8, 10). This is likely a consequence of limitations of the methods used and in the availability of relevant data.

GLS Components

1) Minimum Age for Obtaining a Learner’s Permit and an Intermediate Licence

In principle, a lower minimum age for obtaining a Learner’s Permit and a higher minimum age for obtaining an Intermediate Licence serves to increase the duration of the Learner phase and, therefore, the opportunity for novices to obtain supervised practice under relatively low-risk conditions. It also serves to delay the start of solo driving.

As can be seen in Table 1, there is much variation across Australasian jurisdictions in the minimum age for obtaining a rider Learner’s Permit, ranging from 15 years in New Zealand to 18 years in Victoria and Queensland. This is broader than that for novice car drivers, for whom the minimum Learner age ranges from 15 years in New Zealand to 16 years in all Australian jurisdictions, except in the Australian Capital Territory (ACT) where the minimum age is 15 years 9 months. Of note is that Queensland requires novice riders to have held an Intermediate or Full car driver’s licence for at least 12 months prior to applying for a rider Learner’s Permit.

Across jurisdictions, there is relatively greater consistency, in general, between the rider and car driver licensing systems in the minimum age at which an Intermediate Licence can be obtained (see Table 1). The minimum age for obtaining an Intermediate Licence to ride a motorcycle ranges from 15 years 6 months in New Zealand to 18 years 6 months in New South Wales (NSW), while for car drivers, the minimum age ranges from 15 years 6 months in New Zealand to 18 years in Victoria. The discrepancy in the Learner’s Permit minimum age between the rider and car driver licensing systems results, in some jurisdictions, in a shorter Learner phase for riders than for car drivers. The duration of the Learner phase is considered further in the next section. It is important to note that in no jurisdiction is the minimum Learner age or the minimum Intermediate Licence age younger for riders than it is for car drivers. This is an important consideration given the argued benefits for potential skill transfer from car driving to motorcycle riding. This issue is considered below.

Among young novice car drivers driver crash risk has been found to decrease with increasing (solo) licensing age (11) To date, no studies have directly explored the effects of licensing age on the crash risk of motorcycle riders. Some indirect evidence, however, comes from a study undertaken in the United Kingdom by Sexton et al. (12), which showed that the crash liability for a rider aged 60 years with only one year of experience was approximately 70% less than that for a rider aged 17 years with only one year of riding experience. Haworth et al. (13) contend that imposing a high minimum licensing age for riders is likely to be beneficial as it ensures that riders are more mature and, therefore, less likely to engage in deliberate risks and, where the licensing age for car driving is lower than that for motorcycle riding, encourages potential novice riders to become novice car drivers first. The argument here is that skill transfer from car driving to motorcycle riding may occur; however, the extent to which this is actually the case is not clearly understood. Some preliminary insight into this issue derives from a recent study (14)
which used a motorcycle simulator to compare the hazard perception skills of participants who could be distinguished on the basis of their riding and driving experience. Of particular interest here are the comparisons made between the following two groups of participants: experienced drivers (defined as drivers with a Full car driver’s licence) and inexperienced drivers (defined as drivers with a Probationary car driver’s licence) - both of whom had no previous riding experience and who were not licenced to ride a motorcycle. In the driving context, experienced drivers have been shown to demonstrate heightened hazard perception ability relative to novice drivers (15). In their study, Liu et al. (14) found that the experienced drivers demonstrated superior hazard perception skill in the riding context compared with the inexperienced drivers. Specifically, in the rural simulation, which included hazards such as other vehicles, changes in speed limit, and changes in road surface quality, the experienced drivers had significantly fewer crashes than their less experienced driver counterparts.

In summary, while there is evidence that a younger minimum age for the Learner’s Permit and an older minimum age for the solo Intermediate Licence is suitable for novice car drivers, further research is necessary to determine the appropriate minimum age for motorcycle riders. Minimum age considerations will need to take into account, among other issues, the potential for positive skill transfer from car driving to motorcycle riding. This too is an area for further research.

2) Minimum Time Period for Holding a Learner’s Permit

The longer the minimum Learner and/or Intermediate periods, the greater the opportunity for novice riders to obtain practice under conditions of low-risk, and the likelihood that certain licence conditions/restrictions will be imposed for sufficient duration in order for any benefits in terms of crash risk to be realised.

As with the minimum age for obtaining a Learner’s Permit, there is much variation across Australasian jurisdictions in the minimum time period for holding a Learner’s Permit (see Table 1). For example, for novice riders, the minimum Learner holding period ranges from 3 months (Victoria, NSW and ACT) to 6 months (all other jurisdictions); although, in Queensland, riders who undertake Q-RIDE (competency-based training and assessment program) have no minimum Learner’s Permit holding period. In contrast, the minimum Learner holding period for novice car drivers is generally longer, ranging from 6 months (ACT) to 12 months (Victoria). Of further note is that Victoria has a reduced minimum Learner period for novice drivers aged 21 years or over, and NSW has no minimum Learner holding period for drivers over 25 years. Whether older applicants should receive exemptions as part of the licensing process is the subject of much debate (e.g. 13). Understanding the implications of older applicant exemptions is particularly important in the context of rider licensing given the trend in many jurisdictions of individuals first embarking on motorcycle riding as older adults.

The effect of length of the Learner period on rider crash risk has not been explored previously. In the case of novice car drivers, increasing the duration of the Learner period (by lowering the minimum age for obtaining a Learner’s Permit) has been shown to have a positive effect on crash risk for those novices who made use of the longer period (16, 17). However, if this effect were mediated by supervision, then it could be argued that a longer Learner period may not be as beneficial for novice riders, if the Learner period does not require supervised riding practice. Further, Haworth et al. (13) argue that minimum time periods for accruing practice and gaining experience are more likely to be ineffective when riding is undertaken as a recreational activity rather than as the main mode of transport. Haworth et al. (13) also state that a more effective and direct approach to ensuring sufficient practice would be to mandate logging hours of practice. Although, it should be recognised that, in the absence of supervision as a requirement during the Learner phase, this approach may require a strict mentor to help ensure novice compliance with the log book requirement and that the log book is completed accurately and truthfully. The issue of supervision for motorcycle riders as part of the licensing process is considered next.

3) Supervision Requirements During the Learner Phase

Supervision by an appropriately qualified individual during the Learner phase is a defining characteristic of car driver GLS. However, due to the impracticalities associated with the provision of supervision for the novice rider, supervision is less often a feature of the Learner phase of rider GLS. All Australasian jurisdictions mandate supervised driving as part of the Learner phase of the car driver GLS. In contrast,
only two (Queensland and Western Australia) of the nine jurisdictions require Learner riders to acquire practice under supervised conditions (Table 1).

Supervised driving is associated with a smaller crash risk for novice drivers than unsupervised driving (8, 17). For the novice rider, however, the effects of supervision on crash risk are unknown. In considering the merit of supervision for Learner riders it is important to recognise that riding with a supervisor either as a pillion passenger or seated in a sidecar could increase the difficulty of the novice’s task of maintaining balance and coordination. Under such circumstances, any potential benefit to be gained from supervision might be negated. To address this issue, Mayhew and Simpson (8) suggested that the supervisor ride near the novice rider on another motorcycle or follow closely in a passenger vehicle. However, such an approach is unlikely to be of benefit if the value of supervision derives from more than just the supervisor’s physical presence. In the case of novice drivers, at least, the benefit of supervision has been reported to be in the nature of the interaction between the supervisor and the learner (18). Indeed, a recent trend in novice driver safety has been to educate supervisors in order to maximise the effectiveness of their supervision. The implication for riding is that, provided the supervisor is appropriately qualified (i.e. fully licenced rider) and can communicate with the novice (albeit remotely), then the case could be made that Learner riders would also benefit from supervision. Suitable communication technology may help to address this challenge. On the other hand, a requirement for supervision might inadvertently reduce the amount of riding by novice riders or even discourage potential riders from becoming riders, due to the potential limited availability of appropriate supervision (13). Further research is required to understand clearly the potential implications, positive and negative, of supervision during the Learner period on subsequent riding performance and behaviour. The implications on rider mobility would also need to be considered.

4) Blood-Alcohol Content (BAC) Restrictions

A BAC restriction requiring that novice riders maintain a zero-level BAC while riding serves to ensure that novices are not alcohol-impaired when they ride. All Australasian jurisdictions, with the exception of the ACT and New Zealand, have a zero-BAC restriction, which applies at least across the Learner and Intermediate phases of their respective licensing systems (see Table 1). This is the case for both rider and driver licensing.

There is much evidence relating alcohol consumption to motor vehicle crashes. Moreover, as discussed by both Haworth et al. (13) and Mayhew and Simpson (8) there is evidence that, even at low levels of alcohol, the crash risk of novice drivers is more severely affected than that of older, more experienced drivers.

There is also considerable evidence demonstrating a link between alcohol and motorcycle crashes (e.g. 19-23). Haworth et al. (13), for example, cite a European study which found that alcohol-involved riders were over-represented among crashed riders and that the risk of crash involvement while under the influence of alcohol was 2.7 times greater than the risk when sober. In a recent study undertaken in the United States, Creaser et al. (24) demonstrated significant decrements in riding performance following different levels of alcohol intoxication (0, 0.02, 0.05, 0.08% BAC). Riding performance was assessed on a test track with task scenarios which were based on the Motorcycle Safety Foundation’s training program. Adverse effects on riding performance were found at the two highest levels of alcohol intoxication. For example, in a hazard avoidance task where a warning was provided when the motorcycle was 1.5 seconds away from the hazard, participants took longer to react to the hazard in both the BAC 0.05 and 0.08 conditions compared to the zero-BAC condition. Some negative performance effects were also observed at the lower BAC of 0.02%. For example, participants in all alcohol conditions demonstrated a tendency to drive at faster maximum speeds and with greater speed variability in a curve negotiation task than they did in the zero-BAC condition. Further, there is evidence that alcohol is implicated more frequently in the fatal crashes of motorcycle riders than in the fatal crashes of car drivers (e.g. 21). This is often attributed to the importance of coordination and balance in motorcycle riding (e.g.13).

While there is no direct evidence of the effect of alcohol on the crash risk of novice riders relative to more experienced riders, there is strong evidence from evaluations of zero-BAC restrictions among novice car drivers that such a measure is effective in reducing the crash risk of this group (8). This result, coupled
with knowledge of the effects of alcohol consumption on riding in general, confirms the value of a zero-BAC for novice motorcyclists across the Learner and Intermediate phases of licensure.

5) Automatic Transmission Restrictions

Automatic transmission restrictions prohibit novices from driving/riding a vehicle/motorcycle with a manual transmission. While almost all Australasian jurisdictions have an automatic transmission restriction in place for novice drivers, only NSW and Queensland impose such a restriction on novice riders (see Table 1). In NSW, for example, the form of this restriction is such that riders who complete their Pre-Learner rider course or Pre-Provisional (Intermediate licence) rider course on a motorcycle with an automatic transmission are restricted to riding automatic motorcycles during the Learner phase and the first stage of the Intermediate phase, respectively.

Beyond the skills that are required to drive a vehicle with an automatic transmission, driving a vehicle with a manual transmission requires coordination of the accelerator, clutch, gears and brakes. Accordingly, controlling a vehicle with a manual transmission is generally considered to be more demanding than controlling a vehicle with an automatic transmission. Given their inexperience, this effect may be particularly pronounced for novice drivers, although this remains to be demonstrated empirically. A similar logic can be seen to apply to motorcycles with an automatic transmission versus those with a manual transmission.

It is interesting to note that as motorcycles with an automatic transmission, typically, are of a larger engine capacity, they may not comply with the engine capacity and power-to-weight ratio restrictions that are in place in jurisdictions across Australia and New Zealand. In Victoria, for example, Learner riders, and riders during the first 12 months of their licence, are not permitted to ride a motorcycle that is not part of the Learner Approved Motorcycle Scheme (LAMS). In general, approved motorcycles under this scheme are those with an engine capacity not exceeding 660cc and with a power-to-weight ratio not greater than 150kW/t. In some other jurisdictions, Learner and Intermediate riders are not permitted to ride motorcycles with an engine capacity of greater than 250cc (e.g. New Zealand). The implication is that the only type of powered-two-wheeler with an automatic transmission that would have the potential to comply with engine capacity or combined engine capacity and power-to-weight ratio restrictions would be scooters, which in contrast to motorcycles (step-over design) are often associated with a step-through design. This raises the issue of whether an automatic restriction would sufficiently address the specific needs of scooter riders (see 13). Sales data released by the Federal Chamber of Automotive Industries, indicates that sales of scooters in 2008 represented a 7.6 percent increase compared to 2007 (www.fcai.com.au/motorcycles/introduction). Thus, given the increasing popularity of scooters, the question has been asked of whether a separate licence class should be introduced for individuals who wish or intend to ride a scooter, but not a motorcycle. The implications, regulatory and otherwise (e.g. training and testing), would need to be considered before such a decision is made.

Conclusion

Graduated licensing aims to address the high crash involvement of novice riders and drivers by delaying full licensure until the novices have gained some initial experience in conditions of relatively low-risk. The development of GLS for motorcycle riders, relative to that for car drivers, is still in its infancy. There exists a paucity of data on the effectiveness of GLS for novice riders. In general, additional research is required to explore and to help fill current gaps in knowledge. While it is acknowledged that, increasingly, more is becoming known about the crash types and skill deficits (namely hazard perception) of novice riders, additional research is still required to better delineate the underlying mechanisms. Implicit in this aim is the need to determine to what extent knowledge and skills from car driving transfer to motorcycle riding, and the role of supervision and practice (quantity and quality) during the Learner period for riders.

Currently, much of the components of rider GLS are based on extrapolations from car driver GLS and knowledge of skill deficits in novice car drivers. Further development of such systems would benefit from more systematic evaluation of existing approaches using mass crash data, and of a greater understanding of the skill differences between novice and experienced riders. As noted above, currently, data pertaining
to these issues are largely lacking. The way in which technology can be used as part of the licensing process for riders offers another exciting and promising avenue of research.

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References


# Table 1: Current practice in rider and car driver licensing in Australia and New Zealand on selected GLS components

(L = Learner phase; P = Intermediate licence phase; ACT = Australian Capital Territory)

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Rider</th>
<th>Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria</td>
<td>L: 18y; P1: 18y 3m</td>
<td>3m</td>
</tr>
<tr>
<td>New South Wales</td>
<td>L: 16y 9m; P1: 17y</td>
<td>3m</td>
</tr>
<tr>
<td>Queensland</td>
<td>L: 18y; P: 18y 6m</td>
<td>6m (Q-SAFE) or none (Q-RIDE) &amp; have held a P or Full car licence for at least 1y in previous 5y</td>
</tr>
<tr>
<td>South Australia</td>
<td>L: 16y; P: 16y 6m</td>
<td>6m</td>
</tr>
<tr>
<td>Western Australia</td>
<td>L: 16y; P: 17y</td>
<td>6m</td>
</tr>
<tr>
<td>Tasmania</td>
<td>L: 16y 6m; P1: 17y</td>
<td>6m</td>
</tr>
<tr>
<td>Northern Territory</td>
<td>L: 16y; P: 17y</td>
<td>6m</td>
</tr>
<tr>
<td>ACT</td>
<td>L: 16y 9m; P: 17y</td>
<td>3m</td>
</tr>
<tr>
<td>New Zealand</td>
<td>L: 15y; P: 15y 6m</td>
<td>6m</td>
</tr>
</tbody>
</table>

1 Q-SAFE here refers to the practical riding test for the rider licence; 2 Q-RIDE refers to the competency-based training and assessment program for Learner riders. It offers an alternative to the Q-SAFE path.