

The Effectiveness of Driver Training/Education as a Road Safety Measure

2016 Edition/Update

Introduction

Debate continues in Australia and overseas about the value of training (or education) for car drivers as a means of improving driver behaviour and reducing road crash involvement (1-6). This document provides an up-to-date summary of scientifically-based Australian and international research about the effectiveness of driver training/education programs for:

- learner drivers,
- young/recently licensed drivers, and
- experienced drivers.

This document is an update of a comprehensive literature review that was first published in 2001, and has since been updated in 2007 and 2011. It summarises and references relevant reports, papers and other publications published in scientific journals, conference proceedings or by reputable sources such as government agencies, universities, and research organisations over the last 40 years.

These publications applied scientific principles to the evaluation of the effects of driver training on crash involvement, crash risk or other factors such as driver behaviour.

Effectiveness means the degree to which driver training/education programs reduce the participant's risk of crashing compared with drivers who did not undertake such programs.

While driver training and driver education are not the same, these terms are often used synonymously. Driver training is usually practical, often in-vehicle, and focused on building specific skills and competencies, usually over a short time period. Driver education is broader. While it includes driver training, it also encompasses knowledge about road laws and road safety concepts together with attitudinal and behavioural issues and typically includes in-class learning. As many driver training programs have been termed "education" published materials labelled as both "driver education" and "driver training" are considered.

The effectiveness of driver training/ education for learner drivers

Learner drivers are particular targets for driver training/education efforts of various types (2, 3, 7-11).

Pre-licence training/education programs

Various organisations or groups operate specific driver training/education programs for learners and pre-learners. These programs usually aim

to encourage the development of safe driving techniques, and can involve road law knowledge tuition and some in-car components, either on an off-road track or circuit, or on-road under supervision.

Early research literature suggests that some driver training can be useful in imparting basic car control and road law knowledge skill (4, 9-19). However, the contribution of these courses to post-licence reductions in casualty crashes or traffic violations is weak and inconclusive. More recent research has found some favourable results to driver education and training, including crash reductions (20, 21). However the positive results were typically small and need to be interpreted with caution as with the early

research literature, these more recent studies are confounded by methodological flaws (4, 9-21)

Further, some of these programs that have been made compulsory and offered through high schools in overseas countries, have not been found to be effective and may contribute to increased exposure-to-risk for young drivers, particularly females, by encouraging early solo licensing (2, 19, 22-28).

There is also considerable evidence that driver training that attempts to impart advanced skills such as skid control to learner drivers may contribute to increased crash risk, particularly among young male drivers (6, 7, 17, 18, 26, 29-31). This pattern of results has been confirmed and replicated across numerous studies conducted in Australia, New Zealand, North America, Europe and Scandinavia over the last 40 years (e.g. 31-41). Accordingly, there has been a move away from involving learner drivers in such driver training courses (42).

Evaluations of pre-licence training programs have generally found no significant differences between learners trained off-road (i.e. at off-road facilities that are not part of the road network) and those trained on-road, in real world driving conditions, in respect of subsequent crash or violation involvement (32-34, 39, 43). Off-road training is more expensive to provide than on-road training as off-road facilities are costly to build, operate and maintain (32, 34, 43). Such facilities may also divert scarce funds away from more effective road safety initiatives and countermeasures.

Driving instruction for learners

Basic driver training works at an instructional level. Most people are initially trained to drive by a driving instructor, friends, relatives, or a combination of these, in order to obtain their driver licence. This type of driver training concentrates on basic car control skills, driving techniques, road law knowledge and initial driver licensing (44, 45).

Greater levels of supervised, real world experience during the learner period have been shown to reduce post-licence crash involvement by up to about 35% (46-49). Comparisons of the post-licence crash experience of learners who were trained exclusively by professional driving instructors and those trained exclusively by parents, relatives or friends, have shown no difference, or favourable outcomes for those trained by professional instructors (30, 50-52). Importantly, research shows that encouraging cooperation between driving schools and parents in learner driver training may be beneficial in increasing the quality of instruction and the quantity of learner driver experience (53, 54), for example, the Keys2Drive program.

Keys2Drive is a federally funded program delivered by the Australian Automobile Association (AAA) whereby a learner driver, accompanied by his or her main

supervising driver, can participate in a free driving lesson. An evaluation of the program (55) showed that compared to the general learner population the Keys2Drive participants held the learner permit for longer and gained more hours practice with practice distributed more evenly over the learner period. Effects on later risky driving outcomes however, were mixed.

It may also be useful to provide guidance to professional instructors in respect of the type and extent of pre-licence experience that learner drivers should receive (where, when, how and what) before being presented for initial licence assessment - this proved useful in Denmark and the Netherlands (56, 57). Historically, many instructors have focused more narrowly on preparing novices for licence testing. More recently, there has been a move for driving instructors to take a coaching approach in their instruction, for example the European Union HERMES project (58). The HERMES project involved using the best evidence to develop a set of resources to assist instructors to take a coaching approach in their instruction. The coaching approach has been increasingly adopted in adult education (58).

Research suggests that the best learning environment for the beginning driver is the real road system under the supervision of an experienced driver or instructor (15, 18). It has also been suggested that training for learner drivers should be structured, with lower level skills taught first (50). Learner drivers under supervision on-road have a low risk of crash involvement, probably the lowest of all driver groups (59, 60). The accumulation of an on-road driving "experience bank" is perhaps the major potential contributor to reduced crash risk in solo driving for novice drivers (9, 27). Research has demonstrated that those who gain higher amounts of driving practice gain more experience in driving in challenging situations during the learner phase (61).

In New Zealand, New South Wales, and some North American States or Provinces, the completion of approved driver education or training (provided by driving instructors or via high school driver education) has allowed novice drivers to shorten their learner permit period, lower the number of experience hours required for a solo driving licence and/or reduce the duration of the provisional licence term. Research has shown that the provision of these "time discounts" has resulted in significant increases in crash involvement among new solo drivers granted this discount (62-65). Programs that lead to earlier licensing or substitute for on-road experience are not supported by the literature (4, 5, 17, 18, 66).

The effectiveness of driver training for young and/or recently licensed drivers

Some young or recently licensed drivers attend post-licence driver training courses in the belief that this may improve their driving skills and reduce crash risk. At face value, this has some intuitive appeal. New drivers are at greatest crash risk in the first six months of solo driving (67, 68). However, there would appear to be little evidence that training programs undertaken by young and/or recently licensed drivers are effective in reducing crash risk or traffic violations (9, 26, 69-71). Such training often leads to an increase in confidence and optimism bias (i.e. where novices can believe that they are more skillful than they actually are) and sometimes an increase in crash risk for novices, particularly young male drivers (15, 22-26, 57).

The effectiveness of driver training for experienced drivers

There is no sound evidence that either advanced or defensive driving courses reduce the crash involvement of experienced drivers who attend them (7, 8, 72-74). There is also research that indicates that providing training to experienced drivers may undermine their safety by offsetting the benefits of vehicle safety technology (75). This is perhaps not surprising as such drivers, particularly those between the age of 26 and 59 years, are quite experienced and already have a relatively low crash risk per distance travelled.

While not effective in reducing crash involvement, there is some limited, but encouraging, evidence that education and training aimed at older adults can be effective in improving driver performance and knowledge (76, 77). More recently, cognitive training programs have emerged to improve older driver safety. The available evidence suggests that these programs are likely to improve performance on the specific cognitive task, but the improvements do not transfer to simulated and real world driving. There is also emerging evidence that computer-based and simulated 'driving-specific' training programs hold promise and are more likely to transfer to older driver on-road performance, however this is an area that needs further investigation (78).

There is evidence from mainly US studies that some programs designed to reduce offence rates among drivers with a history of traffic violations may be effective, but this does not seem to translate into reduced crash involvement (79, 80).

Driver training may be more effective in fleet settings than for drivers in general (7, 81-83). However, crash reductions among fleets that have been attributed to driver training programs often disappear when the effects of other factors are taken into account (84). Swedish research suggests that other more economical measures, such as group discussion on safety issues and incentive programs may be more effective in crash reduction terms than driver training programs (8, 84), as well as reducing risk exposure by eliminating or reducing unnecessary car journeys (73).

Why does driver training/education not seem to be effective in reducing crashes?

Promoting conventional driver training/education as a means of improving car-handling driving skills and knowledge assumes that there are deficiencies in the skills or knowledge of drivers, or that the knowledge and skills have not developed yet, and that these can be improved via training/education. It also assumes that these skill deficiencies increase the risk of crash involvement. These assumptions are largely false and based on beliefs not supported by the weight of research evidence (12, 85, 86).

It may be unreasonable to expect conventional driver training/education to deliver crash reductions (7, 12, 86, 87). Improving knowledge and skill does not always lead to a change in behaviour among drivers. Furthermore, a driver trainer has little control over the post-course behaviour of trainees, the motivation of trainees to apply what has been learned or the many other risk factors that may contribute to crash causation. Drivers, particularly young drivers, can and do take risks that have little to do with how much skill and/or knowledge they have, but much to do with motivation, exposure and psychological factors (7, 9, 86, 88-91). There is little evidence to suggest that conventional driver training/education accelerates the development of hazard perception skills, or other cognitive skills. These skills are developed largely via the experience of real world driving (10, 15, 27, 44, 92). Conventional driver training may not provide enough, or the right kind, of real world driving in order to be effective in reducing crashes.

Some driver training/education programs claim to modify "attitudes". Even if attitudes could be changed it would not necessarily be helpful as there is a poor causal relationship between attitude and actual behaviour, including those relating to driving (85, 93-95). In addition, relatively short term driver training/education programs are unlikely to undo firmly established past learning laid down through

weeks, months and years of practice and experience, nor alter motivation or change underlying personal values.

Alternatives and improvements to conventional driver training/education

Research suggests that alternative road safety initiatives, or alternative approaches to conventional driver training/education may be more beneficial than conventional driver training/education, particularly among novice drivers. Alternatives worth considering include:

Increasing the amount of supervised on-road experience that learner drivers receive:

Research shows that learners who received about 118 hours of supervised experience had up to 35% fewer crashes than those who received only 41-47 hours (46). Later research also showed that, those who practised more as learner drivers had lower crash involvement after licensing (49, 96, 97) and fewer safety-critical driving errors in an on road assessment (98). Many jurisdictions now require learner drivers to accumulate a minimum number of supervised, on-road instruction/experience hours prior to solo driving (e.g. 100 in Queensland and 120 in Victoria and NSW) (10). This practice is becoming more common in other jurisdictions in USA, Canada & some European countries (e.g. Germany) (49, 57).

In the US, a recent study suggests that a web-based intervention could improve supervised practice amongst pre-licensed teenaged drivers (99). In Victoria, information and resources for parents and other experienced drivers who provide supervision for learners are now readily available from agencies such as VicRoads, the Transport Accident Commission (TAC) (100) and the Royal Automobile Club of Victoria (RACV) (101). VicRoads also manages a mentoring program (L2P program) to assist learner drivers without access to a supervising driver or vehicle, to gain the driving experience required to apply for a probationary licence (102).

A different type of training/education:

Improvements in driver training may be achieved in the longer term by concentrating on cognitive and perceptual skills, together with a greater emphasis on how factors such as beliefs and motivation shape driver behaviour (27, 28, 86, 52, 103, 104). This would require a different type of program than is usually offered. Education programs delivered over

several years, perhaps through secondary schools, to foster development of safe attitudinal /motivational factors, have also been suggested as an alternative to short-term driver training, as has multi-stage driver education that is integrated within a Graduated Licensing Scheme (GLS) (28, 103, 105-108). While theoretically sound, the effectiveness of such programs in effecting changes in attitude, behaviour or crash risk is yet to be proven (9, 27, 28).

There is support for the development and application of programs that target optimism bias, over-confidence and attitudinal or motivational factors that influence driving behaviour (31, 109, 110). Several programs using this approach – sometimes referred to as “Insight” training - have been trialled in Sweden (111), the Netherlands (112) and Belgium (113), for example. While some studies have relied on survey-based or behavioural data, crash outcomes have been examined for some programs. For example, alternative driver training programs in Austria, Denmark, Finland and Luxembourg have been subject to crash based evaluation (6). While the programs varied in terms of content and structure, they were designed to address higher order skills and over confidence, along with other issues. The results showed that these European programs are associated with lower crash risk, although further work is required as there are some methodological shortcomings in the evaluations (6).

Some research in Australia and New Zealand has shown there may be potential for alternative training programs to have a positive impact. There is some evidence that focusing on resilience and risk reduction could be associated with a reduced crash risk (RRISK program) (114, 115). In New Zealand higher order cognitive skills training has been shown to have a positive influence on a small sample of young drivers (91). To be conclusive about the effectiveness of such approaches and their effectiveness in the Victorian context, more research is required. The P Drivers Project is a large scale research project will contribute to a better understanding of the effectiveness of post licence novice driver training.

The P Drivers Project

The Australian, New South Wales and Victorian Governments are conducting the P Drivers Project which is a crash-based trial of a best-practice novice driver education program involving young P-plate drivers in Victoria. The crash rate of these young drivers will be compared with those of a matched control group that did not complete the program. In addition, young novice drivers in New South Wales participated in a process trial of the program. The project is jointly funded by the three governments, the TAC, the Federal Chamber of Automotive Industries (FCAI), Insurance Australia Group (IAG) and RACV.

The intent of the project is to measure the road safety

effects of best-practice approaches to the training and development of novice drivers. It is anticipated that approximately 5,000 participants will complete the project which began in 2011. The program delivery phase is complete and follow up data collection is likely to be completed in late 2016. For further details visit the P Drivers Project website (116).

Technology-based hazard perception training

Recent research has focused on the training of hazard perception skills, often using computer-based or driving simulator technology (117). Technology-based training programs can give participants exposure to risky scenarios, that they may otherwise rarely face on-road, in a safe environment (118). Results have shown some improvement in hazard perception, attention maintenance, visual scanning behaviour, and road hazard handling performance in simulated driving (119-127). At this stage the research is largely experimental and does not appear to be developed to the point where it could be considered as a viable intervention alternative. In addition, more work is required to understand how the computer-based and simulator findings might transfer to the on-road environment and if the benefits are maintained over time.

Graduated Licensing Schemes:

Under a Graduated Licensing Scheme (GLS) novice drivers do not receive an unrestricted solo driver licence immediately and must gain experience under lower risk conditions (e.g. zero blood alcohol content) and remain relatively offence free over a period of up to four years (10, 27). GLS programs can be described as “apprenticeship” systems for new drivers where they gain experience under less risky driving conditions before “graduating” to an open licence with few restrictions (128). GLS programs have been referred to in developmental science as an almost perfect example of a developmentally appropriate intervention (90) and a critical public health opportunity (129).

While GLS programs vary in content and duration and apply across jurisdictions with minimum solo licensing ages ranging from 15 to 18 years, the central risk reduction aim is the same (27, 100). To be effective, GLS conditions need to apply to all new drivers regardless of where they live as increased crash risk is not confined to rural, regional or urban areas (92, 130).

While many individual GLS programs differ in respect of the conditions they contain, crash-based evaluations in New Zealand and North America show statistically significant reductions in novice driver crashes typically ranging from about 7% to over 20% (27, 128, 130-132). The observed reduction in fatal crash involvement among young drivers in the USA is consistent with the introduction of GLS programs

(131, 133). In Victoria, a crash based evaluation of the GLS program introduced in 2008, has shown reductions in crash involvement of 23% among young first year novice drivers (134). A preliminary evaluation of the GLS introduced in Queensland in 2007, showed a 30% reduction in novice driver fatal crashes and 13% reduction among novice drivers in fatal and serious injury crashes combined (135).

Several recent research papers and literature reviews have focused on identifying which of the GLS conditions contribute to the reduction of risk among young drivers. Research shows that GLS effects are strongest in first two years of solo driving, particularly in the first year (136). Restrictions on passenger carriage and late night driving in the first six to 12 months of solo driving are effective measures (26, 106, 137-140). Minimum durations for the learning to drive phase and delaying of licensure are also effective at reducing crash risk (138-140). Zero blood alcohol content requirements too have been demonstrated to be beneficial (139, 140).

Most Australian States and Territories have a GLS of some kind. For example, Victoria applies a GLS approach to novice drivers which, among other conditions, includes restrictions on driving with peer passengers and mobile phone use for novices along with the requirement for learner drivers to accumulate at least 120 hours of supervised on-road experience before being eligible for a probationary licence (141).

Research into improving GLS continues. This includes enhanced enforcement, improved assessment and providing guidance for the parents of novice drivers subject to GLS conditions (142).

Higher Order Testing within a Graduated Driver Licensing Program:

Some graduated driver licensing programs require novices to pass additional tests of higher-order skills to progress to less restricted licensing levels and to “graduate” to full licence status. For example, the NSW and QLD GLS require novices to pass a screen-based Hazard Perception Test (HPT) in order to graduate from the most restricted P1 licence (the first solo licence) to the less restricted P2 licence (143, 144). These are screen-based computer tests that measure the candidate’s ability to recognise and respond to potentially dangerous situations and to react appropriately. Preliminary research from Victoria’s use of similar hazard perception testing within the probationary licensing system (to progress from learner to the probationary stage) suggests that such tests can predict novice drivers likely to be at greater crash risk (145). It is recommended that HPTs are used in the progression from the learner stage to probationary driving (140). Research into the effectiveness of HPT is continuing in Australia and overseas (147-148).

Role of parents:

Parents are an important influence on young drivers, beyond providing practice opportunities for their learner drivers. Parental modelling of aggressive driving styles has been shown to translate to increased likelihood of aggressive driving among their children (149, 150), via observational learning from a young age. There is also a growing body of research which suggests that interventions targeting parents can reduce risk for young drivers, via their monitoring of risky behaviour and enforcing of compliance with GLS conditions (151-154). Indeed, it has been recommended that pre-driver education involve parents (103, 155).

Comprehensive fleet management safety programs:

A combination of approaches can help reduce crash risk and involvement within company fleets (82, 84, 156-158). A multifaceted approach to fleet safety dealing with the selection of vehicles (i.e. purchasing only vehicles with a Australasian New Car Assessment Program (ANCAP) 5-Star safety rating) and management of where, when and how vehicles are used may help reduce crash risk. Research has identified ways of increasing fleet safety via the application of best practice approaches (156). This includes the implementation of integrated occupational health and safety policy and practices within the organisation to influence fleet vehicle selection, education about safe vehicle use for employees, incentives for crash free driving (not rewards) and the promotion of a safety culture within the organisation (156-158). Research into understanding and improving fleet safety continues (159-161).

Conclusions

Overall, the research evidence suggests that conventional driver training/education contributes little to reductions in accident involvement or crash risk among drivers of all age and experience groups.

Low individual crash risk and decay of learning work against the potential effectiveness of driver training programs that concentrate on car control skills or deal with rare events such as emergencies. The high motivation which trainees usually bring to driver training does not compensate for these factors.

Improving driver knowledge and skill does not always lead to a change in on-road behaviour or reduced crash risk among trainees. While skill and knowledge are important, particularly for novice drivers, they have little influence on the driving environment or conditions under which driving behaviour occurs post-training. On-road driving experience is fundamental to the development of higher-order cognitive skills related to driving (e.g. hazard perception). Conventional driver training is unlikely to undo firmly established past learning laid down over weeks, months and years of practice and experience, nor alter motivation or personal values.

It is of concern that the provision of conventional driver training beyond that required to gain an initial driver licence can lead to increased crash risk among novice drivers. Research suggests that this is because the training can encourage earlier licensing, increase exposure-to-risk and/or unduly increase the confidence of novices about their driving abilities.

Resources committed to conventional driver education/training may also divert scarce funds and community attention away from more effective initiatives likely to reduce crash risk. Research into how training and education could be improved is continuing, for example the P Drivers Project, which is investigating best-practice approaches to the training of novice drivers.

Interventions and young people

Elements of the wider system need to work together to support young drivers (162). Interventions need to support the developmental vulnerabilities of young people, recognising the key influences on their behaviour (90). Research (see 90) shows:

- Brain development continues until the mid twenties, especially the area responsible for regulating impulsivity, controlling emotions and anticipating consequences.
- It is normal for adolescents to take risks, seek new experiences and test their boundaries; it is part of becoming an independent adult.
- Adolescents are more reactive emotionally and reactive to stress. This can impair their decision making and task performance.
- Parents are a powerful influence, even throughout young adulthood (163).

There is some limited, but encouraging, evidence that education and training aimed at older adults is effective, however more research is needed in this area. There is also some suggestion that, due to its high face validity and popularity, driver training may have a place in risk reduction programs in fleet settings, but only as one small part of an integrated road safety program.

A better alternative for novice drivers is to promote extensive driving experience among learners. This approach has been taken up by most Australian driver licensing jurisdictions and some in North America via the implementation of GLS which require or encourage learner drivers to gain more supervised, on-road driving experience before solo driving. However, these approaches require cooperation between novice drivers, parents (or supervisors) and professional driving instructors over a period of months and perhaps years.

New approaches to driver training may eventually prove to be useful in reducing crash risk. Research and development in respect of alternative driver training/education programs show some promise, and some programs addressing higher order cognitive skills (e.g. hazard perception), have shown some potential to be effective in reducing casualty accident risk/involvement among young drivers. More research is required. In the interim, other approaches such as increased supervised experience and graduated licensing for novice drivers, have been shown to have positive and lasting contributions to road safety.

This monograph is based on a report ("The Effectiveness of Driver Training as a Road Safety Measure: A review of the literature") prepared for RACV in 2001 by the late Dr Ron Christie. It was revised and updated by Dr Allison McIntyre in 2015, and has been critically reviewed by Mr Dan Mayhew. It replaces the 2011 edition/update.

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