

THE EFFECTIVENESS OF DRIVER TRAINING
AS A ROAD SAFETY MEASURE:
A REVIEW OF THE LITERATURE

by

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Title: The Effectiveness of Driver Training as a Road Safety Measure: A Review of the Literature

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Abstract: The effectiveness of driver training as a road safety measure is a controversial issue within the professional and public arena. The worth of driver training for car drivers as a means of improving driver behaviour and reducing road crash involvement is continually debated in Australia and overseas. In an effort to inform road safety professionals, and the public at large, about the merits and effectiveness of such training as a crash countermeasure, RACV commissioned RCSC Services Pty Ltd to perform an extensive review of the international literature concerning driver training. In particular, the effectiveness of driver training programs for learner drivers, young/recently licensed drivers and experienced drivers were investigated. The review suggests that driver training cannot be considered an effective crash countermeasure and that other approaches such as increased supervision and graduated licensing for novice drivers are likely to make greater and more lasting contributions to road safety.

Keywords: Driver training, advanced driver training, accident countermeasure, driver behaviour, learner driver, recently qualified driver, accident rate, driver testing and licensing.

EXECUTIVE SUMMARY

There is continuing public and media debate in Australia and overseas about the worth of training for car drivers as a means of improving driver behaviour and reducing road crash involvement. Calls for increased or compulsory driver training are often heard when the road toll appears to be rising in a particular jurisdiction. The purpose of this report is to provide an up-to-date review of Australian and international research about the effectiveness of driver training programs for learner drivers, young/recently licensed drivers and experienced drivers. Effectiveness was taken to mean to what degree driver training programs reduce the crash risk or involvement of participants relative to comparable drivers who did not undertake such programs. However, given that not all published evaluations are crash-based other measures such as positive changes in driver behaviour were also included.

This report examines evaluations and reviews published in scientific journals, conference proceedings or by reputable sources such as government agencies, universities, and research organisations. The report reviews materials published in Australia, New Zealand, North America, United Kingdom and Europe over the last three decades. The greatest credence was given to studies that applied scientific principles to the evaluation of the effects of driver training on crash involvement, crash risk or other factors such as driver behaviour.

Definitions

Driver training and driver education are not the same. However, it has become common even in the scientific literature for these terms to be used synonymously. While education is broad and intellectually based, training is usually practical and focused on building specific skills and competencies, usually over a short time period. This review deals predominantly with driver training rather than education per se. However, given that many driver training programs have been termed “education” there was a need to review published materials labelled as both “driver education” and “driver training” in the course of compiling this report.

In general, driver training can be classified into four basic types:

- pre-licence – to provide people with the necessary vehicle control skills and road law knowledge to qualify for a driver licence;
- defensive driving training - offered at a post-licence level with the aim of helping drivers avoid getting into critical situations;
- advanced driving courses - offered at a post-licence level with the aim of helping drivers cope with critical situations that may arise; and
- driver improvement training - targets accident/violation-involved drivers with a view to reducing recidivism and reducing crashes (often conducted by driver licensing authorities, court networks and/or fleet managers within commercial vehicle fleets).

This report covers issues relating to all four types of driver training.

THE EFFECTIVENESS OF DRIVER TRAINING FOR LEARNER DRIVERS

Learner drivers at the pre-licence level have long been the target of driver training efforts of various types ranging from simple one-to-one instruction to elaborate mandatory programs within driver licensing systems.

Basic driver training works at an instructional level, in that most people who are initially trained to drive by a driving instructor, friends, relatives or a combination thereof achieve licensed driver status. This type of driver training concentrates on basic car control skills and road law knowledge. It is heavily oriented towards initial driver licensing. Initial driver instruction plays an important role in developing basic car control skills and imparting road law knowledge, but it does not guarantee safe or crash free driving on the part of those trained. There is little evidence that pre-licence training per se reduces crash rates among novice drivers in the short or longer term.

Greater levels of supervised experience during the learner period have been shown to result in reduced post-licence crash involvement in Sweden (up to about 35%). Swedish research showed that encouraging cooperation between driving schools and parents in the training of learner drivers may be beneficial in increasing the quality of instruction and the breadth and depth of learner driver experience. The level and variety of traffic experience is generally lower in professional instruction while the breadth and depth of experience received by learners when supervised by friends or relatives is generally greater.

The research literature suggests that, beyond imparting basic car control and road law knowledge skills, pre-licence driver training/education contributes little to post-licence reductions in casualty crashes or traffic violation among novice drivers. In addition, mandatory pre-licence training or even formal pre-licence training/education, such as high school driver education programs in the USA, may contribute to increased exposure-to-risk for young drivers, particularly females, by encouraging early solo licensing. 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 males. This pattern of results has been confirmed and replicated across numerous studies conducted in Australia, New Zealand, North America, Europe and Scandinavia during the last 30 years.

Off-Road or On-Road Training for Learner Drivers?

There is little sound scientific evidence to support the view that novice driver training provided off-road improves the driving behaviour of those trained or reduces their subsequent involvement in road crashes. Evaluations have generally found no significant differences between novices trained off-road (ie on driving ranges or at off-road facilities that are not part of the road network) and those trained on-road in respect of subsequent crash or violation involvement. Off-road training is more expensive to provide than on-road training as off-road facilities are costly to build, operate and maintain. Such facilities may also divert scarce funds away from more effective initiatives and countermeasures. Research from Sweden and North America suggests that the best learning environment for the beginning driver is the real road system under the supervision of an experienced driver or instructor. Learner drivers under supervision on-road have a low risk of crash involvement, probably the lowest of all driver groups.

The accumulation of an on-road “experience bank” is perhaps the major potential contributor to reduced crash risk in solo driving for novice drivers. Swedish research suggests that it contributes to post-licence reductions in casualty crashes of up to 35% for novice drivers.

THE EFFECTIVENESS OF DRIVER TRAINING FOR YOUNG AND/OR RECENTLY LICENSED DRIVERS

The majority of the training effort directed to novice drivers has been at the pre-licence level, few programs specifically target novices in the first few years of solo driving. However, some young/recently licensed drivers will seek out and attend commercial post-licence driver training on their own initiative or on the advice of others who believe that this may improve their driving skills and reduce crash risk. At face value, this has some intuitive appeal. Novice drivers are at greatest crash risk in the first six months of solo driving. 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. Some research-based programs target higher order skills (eg perceptual/cognitive skill development dealing with hazard perception and risk reduction) and attitudinal factors such as over confidence and optimism bias (ie where novices believe that they are skillful and at little risk of crash involvement).

As with other areas of novice driver training, there is no clear evidence that post-licence training for novice drivers leads to reductions in crash or violation involvement. Again, such training often leads to an increase in confidence and sometimes an increase in crash risk for novices, particularly young males. From a theoretical perspective, there is support for the development and application of training that targets optimism bias, over-confidence and attitudinal/motivational factors that influence safe driving behaviour. Several programs using this approach – sometimes referred to as “Insight” training - have been trialled in Sweden and the Netherlands in recent years using behavioural rather than crash-based evaluation methods (ie measuring changes in driving behaviour and attitudes to driving measured via interview or survey techniques). However, there is little evidence thus far that this type of training reduces crash/violation risk among novices as few crash-based studies of these newer approaches to training have been completed.

Training for novices, beyond basic-pre licence training, is limited in its capacity to shape and change driver behaviour. Alternatives to training such as increased experience at the pre-licence level combined with graduated licensing and on-road enforcement regimes may hold more promise.

THE EFFECTIVENESS OF DRIVER TRAINING FOR EXPERIENCED DRIVERS

Reviews of evaluation studies have found no sound evidence that either advanced or defensive driving courses reduce the accident involvement of experienced drivers who attend them. This is perhaps not surprising as drivers between the age of 25 and 59 years are quite experienced and already have a relatively low crash risk per distance travelled.

As with novice drivers, there is little evidence to support the view that driver training is effective in reducing crash involvement. There is some evidence from US studies that some programs may reduce traffic offence recidivism among those assigned to driver improvement programs, but this does not seem to translate into reduced crash involvement.

Some driver training providers claim that their programs produce accident reductions, particularly in fleet settings. Unfortunately, many of these claims are often based on small samples, testimonials or data derived by non-scientific means. Claims of crash reductions due to training intervention often disappear when the effects of other factors are taken into

account. Driver training may be more effective in fleet settings than for drivers in general, but 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.

WHY DOES DRIVER TRAINING NOT SEEM TO BE EFFECTIVE IN REDUCING CRASHES?

Advocating driver training as a means of improving driving skills and knowledge assumes that there are deficiencies in the skills or knowledge of drivers and that these can be remedied by the application of training. It also assumes that such deficiencies increase the risk of crash involvement. These assumptions are largely false and based on beliefs not supported by the weight of research evidence.

It may be unreasonable to expect an educational or instructional tool such as driver training to deliver crash reductions. Improving knowledge and skill does not always lead to a change in behaviour among trainees. 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 possessed, but much to do with motivation and higher-order factors. There is little evidence to suggest that driver training accelerates the development of hazard perception skills, or other higher-order cognitive skills, that are laid down and developed via the experience of real world driving.

Some more recent driver training programs claim to modify “attitudes”. This is unlikely and would be unhelpful even if true as there is a poor causal relationship between measured attitude and actual behaviour. In addition, driver training is also unlikely to undo firmly established past learning laid down through weeks, months and years of practice and experience, nor durably alter motivation or modify underlying personal values.

Most conventional driver training tends to concentrate on skills and knowledge relevant to crash avoidance or dealing with driving emergencies. However, as accidents, particularly those involving death or injury, are rare events for the average driver this knowledge or skill seldom needs to be applied, or is to a large extent forgotten when required at some time in the future. Drivers quickly forget those behaviours which they do not have to use regularly. This is not unique to driving, people lose competence in respect of any set of skills which are not practised, or are engaged in only rarely.

ALTERNATIVES TO CONVENTIONAL DRIVER TRAINING

Recent road safety research suggests that alternatives to conventional driver training may contribute more to crash risk and violation involvement, particularly among novice drivers. Alternatives worthy of consideration include:

- **Building Experience at the Pre-Licence Level:** Increasing the supervised on-road experience that learner drivers receive – recent Swedish 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. VicRoads, TAC, RACV and other road safety organisations are encouraging this approach in Victoria where a minimum of 120 hours of supervised, on-road instruction prior to solo driving is advocated. Programs have been

developed by VicRoads, TAC, and RACV to encourage learners to gain greater supervised experience through cooperation between parents and driving instructors.

- **Graduated Licensing Systems (GLS) for Novice drivers:** Under a GLS novice drivers do not receive an unrestricted solo driver licence immediately and must gain experience under lower risk conditions and remain relatively offence free over a period of up to three years. GLS aims to reduce the crash rates of novice drivers by accumulation of experience under a system that places some key restrictions on where, when and how they drive (eg zero blood alcohol content (BAC), tougher demerit point cut-offs for licence suspension and in some instances restrictions on maximum speed limits). Evaluations of GLS programs in New Zealand and North America show significant reductions in novice driver crashes ranging from 7% to over 55%. Victoria and NSW have GLS programs in place, but these have not yet been evaluated. Preliminary evaluation of the South Australian GLS suggests that it has contributed to significant reductions in casualty crashes involving 16-19 year olds.
- **Higher Order Testing within Driver Licensing Programs:** Some driver licensing programs, (eg GLS) 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 GLS requires novices to pass a screen-based Hazard Perception Test (HPT) to move from the most restricted P1 licence (the first solo licence) to the less restricted P2 licence. This is a touch-screen computer test that measures the candidate’s ability to recognise and respond to potentially dangerous situations and to react appropriately. Those who do not demonstrate these skills to the required level remain on the more restricted licence until they do. A more demanding screen-based test must be passed to “graduate” from P2 level to a full NSW licence. Preliminary research from Victoria’s use of hazard perception testing within its probationary licensing system suggests that such tests can predict novice drivers likely to be at greater crash risk.
- **A Different Type of Training:** 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 attitude and motivation shape driver behaviour. This however, requires a different type of training program. Education programs delivered over several years, perhaps through secondary schools, to foster development of safe attitudinal /motivational factors, using driver testing as motivator, has also been suggested as an alternative to short-term driver training. While theoretically sound, there is as yet no evidence to prove that programs addressing these factors lead to changes in attitude, behaviour or crash risk.
- **Fleet Management to Enhance Crash Reduction:** A combination of approaches can help reduce crash risk and involvement within company fleets. A multifaceted approach to fleet safety dealing with the selection of personnel (eg selecting those with a good driving record) and vehicles (eg vehicles with sound crashworthiness ratings) and management of where, when and how vehicles are used may help reduce crash risk. Recent studies have identified ways of increasing fleet safety via the application of best practice approaches in respect of vehicle selection, training/education on safe vehicle use integrated into company occupational health and safety policy and practice, incentives for crash free driving (not reward) and promotion of a safety culture within organisations.
- **Enforcement and Deterrence:** Enforcing traffic laws and deterring drivers, particularly young drivers, from engaging in behaviour that increases crash risk is an effective way of

reducing crash risk in respect of drink driving and speeding behaviour. Targeted deterrence and enforcement measures have a greater probability of changing driver behavior than traditional driver training programs ostensibly aimed at reducing accident risk.

CONCLUSIONS

The research evidence suggests that driver training of a traditional and conventional nature contributes little to reductions in accident involvement or 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. Conventional driver training is also unlikely to undo firmly established past learning laid down over weeks, months and years of practice and experience, nor durably alter motivation or modify underlying personal values. On-road driving experience is the medium via which most higher order cognitive skills related to driving (eg hazard perception) are developed and maintained.

It is of concern that the provision of conventional driver training beyond that required to gain an initial driver licence often leads to increased accident risk among novice drivers. Research suggests that this is due to encouragement of earlier licensing, increased exposure-to-risk and/or unduly increasing the confidence of novices about their driving abilities.

A better alternative for novice drivers is to address the level of experience (or rather the lack of it) that has been shown to contribute to first year drivers having an elevated casualty accident risk. This approach has been undertaken by most Australian driver licensing jurisdictions and some in North America via the implementation of Graduated Licensing schemes (GLS). GLS provides for and encourages learner drivers to build their stocks of supervised, on-road driving experience before solo driving. Swedish research suggests that it contributes to post-licence reductions in casualty crashes of up to 35%. However, this approach requires cooperation between novice drivers, parents (or supervisors) and commercial driving instructors over a period of months and perhaps years.

Resources committed to post-basic driver education/training can act to undermine effective road safety programs by diverting scarce funds and community attention away from more worthwhile initiatives likely to reduce crash risk. However, there is 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 an adjunct to other more effective accident reduction measures.

New approaches to driver training may eventually prove to be useful in reducing casualty accident risk/involvement. However, much research and development work remains to be done before one could say that driver training is an effective crash countermeasure. In the interim, other approaches such as increased supervision and graduated licensing for novice

drivers and traffic law enforcement for all drivers are likely to make greater and more lasting contributions to road safety.

1.0 INTRODUCTION

There is continuing public and media debate in Australia and overseas about the worth of driver training for car drivers as a means of improving driver behaviour and reducing road crash involvement. Calls for increased or compulsory driver training are often heard when the road toll appears to be rising in a particular jurisdiction. In view of this, there is a need for road safety professionals, and the public at large, to be well informed about the merits and effectiveness of such training as a crash countermeasure.

In early 2001, the Royal Automobile Club of Victoria (RACV) engaged Dr Ron Christie of RCSC Services Pty Ltd to prepare this report which summarises the research findings about the effectiveness of driver training for the drivers of motor cars. RACV has been concerned for some time about communicating accurate information to the community about the effectiveness of driver training.

The purpose of this project was to produce an up-to-date review document that clearly stated the findings of Australian and international research about the effectiveness of driver training programs for the following groups of drivers:

- learner drivers;
- young/recently licensed drivers (novice drivers); and
- experienced drivers.

This report details published, scientific program evaluations, and approaches to driver education and/or training that may not have been evaluated, but are based on sound, scientific research. In a road safety context, effectiveness is taken to mean to what degree driver training programs reduce the crash risk or involvement of participants relative to comparable drivers who did not undertake such programs. However, given that not all published evaluations are crash-based other measures such as positive changes in driver behaviour that may also be of interest have been included.

The report examines evaluations and reviews published in scientific journals, conference proceedings or by reputable sources such as government agencies, universities, and research organisations. These were identified via an extensive computerised literature search and through contacting key road transport and road safety researchers and agencies. The report reviews materials published mainly in the last three decades in Australia, New Zealand, North America, United Kingdom and Europe. Most materials reviewed were published in printed form, however, some were of an electronic nature (eg materials on the World Wide Web – the Internet).

The greatest credence is given to studies that applied scientific principles to the evaluation of the effects of driver training on crash involvement, crash risk or other factors such as driver behaviour. These studies are normally carried out by professionals trained in evaluation design and statistical techniques (eg psychologists, statisticians, epidemiologists or social/behavioural scientists). A scientifically based evaluation is one that:

- has clearly stated measures (eg change in number/rate of casualty crashes or traffic violations) that are valid and measurable;

- uses valid and reliable measurement tools (eg psychometrically sound tests or scale, validated checklists);
- has a valid control group that does not receive the training or intervention but is matched closely to those who did – or employs other valid statistical techniques to compensate for the lack of a control group;
- has a large enough sample to allow valid and reliable comparisons to be made;
- has a representative sample of the population or group of interest (eg learner drivers or probationary drivers);
- uses random assignment to training and control groups to control for volunteer bias;
- controls for other variables that could have influenced or biased the result (eg volunteer bias, conduct of other road safety programs during the evaluation or changes in exposure-to-risk before or after the evaluation);
- is preferably conducted independently by evaluators not connected with the design or delivery of the training program – or uses acceptable techniques to keep the evaluators at “arms length”;
- applies appropriate inferential statistical techniques that allow factors such as random error and other sources of variation to be controlled (eg regression to the mean);
- is planned, conducted and reported objectively;
- is subject to peer review before publication to check for errors or bias; and
- published by a reputable and competent organisation or individual with professional credibility in the field (eg road or transport authorities, universities, research centres, and research consultants).

Some articles and reports published in the popular media are also included to reflect the views often expressed by journalists and commentators about the driver training and education issue. While not necessarily scientifically based, these provide some indication of the perceptions, and sometimes misconceptions, frequently expressed in the mass media.

It should be noted that the report deals primarily with the training and education of car drivers and does not specifically review materials for heavy vehicle drivers or motorcyclists. However, issues relating to driver training within fleet programs are considered. The report does not deal with the use of driving simulators or simulation programs.

The report is fully referenced so that the reader will know what materials were reviewed. This will also enable readers and other interested parties to locate and obtain copies of specific publications, identify particular researchers, research bodies or sources of information on driver training or evaluation issues.

2.0 STRUCTURE OF THIS REPORT

This report reviews the effectiveness of driver training as a road safety measure. To achieve this, the report looks at driver training aimed at:

- **learner drivers** – those who have not yet gained a licence for solo driving, but may have a learner licence/permit that allows them to drive under the supervision of a fully licensed driver;
- **young and/or recently licensed drivers** – those who have gained a solo driving licence, but have less than 5 years driving experience, are usually aged under 25 years and who may be subject to provisional, probationary or graduated licensing restrictions (eg display of P plates, speed limit restrictions, vehicle restrictions); and
- **experienced drivers** – those who have been driving for more than 5 years, are usually over the age of 25 and usually have no specific restrictions on their driving licence.

Before reviewing the published literature in respect of these three groups, the following preliminary, but important issues are addressed:

- the difference between driver training and driver education;
- types of driver training;
- the public and media popularity of driver training and education as a road safety measure; and
- a summary of the relationship between age, driving experience and road crash involvement is provided due to young/inexperienced drivers being a particular target for both formal and informal driver training in Australia and overseas.

Following the review of reports and evaluations dealing with the effectiveness of driver training for learner drivers, young/recently licensed drivers and experienced drivers, conclusions are drawn about the worth of driver training as a road safety measure. Alternatives or modifications to conventional driver training that may be more effective, or potentially effective, in crash reduction terms are also discussed.

2.1 Driver Education or Driver Training: What's in a name?

The reader should note that the terms, driver education and driver training often appear in the literature as synonyms. While driver training and driver education are not the same, it has become common even in the scientific literature for these terms to be used synonymously as though one is a direct substitute for the other (Horneman, 1993; Palmer, 1995). Horneman (1993) notes this early in his review of the driver training and education literature when attempting to define and distinguish the terminology encountered. The term driver education (DE) tends to be used in the North American literature and driver training in the European (Gregersen, 1993; Lynam and Twisk, 1995; Lonero, Clinton, Brock, Wilde, Laurie and Black, 1995). In contrasting the difference in terminology between North America and other countries, Palmer (1995) noted that “... *the rest of the world prefers to use the word training when referring to the specialised instruction for persons who control automobiles*”(p115).

In respect of definitions and terminology, Horneman (1993) wrote that:

It would be useful to distinguish between driver training and driver education. Driver training can be defined as relating to car control or car craft: ie the techniques of handling a vehicle in traffic. This includes teaching a novice driver to change gears smoothly through to advanced use of throttle control in cornering. Driver education, on the other hand, is the teaching of safe driving behaviour and the improvement of knowledge, attitudes and behaviour via publicity, propaganda, exhortation and even legal sanctions. Driver education includes driver training. Road safety education is a broader area again. (p7)

Essentially, education is broad, longer-term, contemplative and value-based instruction and learning. Primary and secondary schooling are perhaps the most common forms of what is properly considered to be education. By contrast, training is usually characterised by a specific instructional program, or set of procedures, designed to yield a particular outcome, often a skilled activity such as operating a sewing machine or how to play a sport such as football. While education is broad, reflective and intellectually based, training is usually practical and focused on building specific skills and competencies, usually over a short time period.

Most of the short courses or programs, often only one or two days in duration, offered to drivers as “education“ would be more properly described as training given their specific, practical focus and low-emphasis on underlying values or cognitive processes. It could be speculated that the term driver education has become popular over time with training providers as it suggests that the course or program offered is more than skill-based learning. As a consequence some driving instructors and post-licence driver trainers style themselves as educators rather than trainers, perhaps including the word “education” in their business names and in their marketing materials.

This review deals predominantly with driver training rather than education per se. However, given that many driver training programs have been termed “education” there has been a need to review published materials labelled as both “driver education” and “driver training” in the course of compiling this report. It should also be noted that this review does not deal with school-based, in-classroom traffic safety education programs relating more to safe road use in general (eg pedestrian, passenger or cyclist safety).

2.2 Types of Driver Training

Driver training comes in a variety of shapes and sizes. However, in general, driver training can be classified into four basic types (Christie, 1996):

- pre-licence – to provide people with the necessary vehicle control skills and road law knowledge to qualify for a driver licence;
- defensive driving training - offered at a post-licence level with the aim of helping drivers avoid getting into critical situations;
- advanced driving courses - offered at a post-licence level with the aim of helping drivers cope with critical situations that may arise; and
- driver improvement training - targets accident/violation-involved drivers with a view to reducing recidivism and reducing crashes (often conducted by driver licensing authorities, court networks and/or fleet managers within commercial vehicle fleets).

This report will cover issues relating to all four types of driver training. While there is some “blurring at the edges” in the literature regarding which type of training a particular program

may have pursued, it is useful to bear in mind that training programs may differ in content and emphasis.

2.3 Popularity of Driver Training as a Road Safety Measure

Training and education are frequently advocated in the mass media and in public forums as solutions to various social and safety problems faced by communities (Ferguson & Williams, 1996; Watson, 1997). As Palmer (1995) puts it, “*The public does, at least at a superficial level, believe in training and continues to accept training’s importance...*” (p120). It is not surprising therefore that parents, policy makers, training providers and members of the public often see additional training for drivers as a means of reducing or avoiding road crashes. The provision of training has intuitive, popular appeal as it is the means by which knowledge and skill is often transferred in the workplace and in the sporting field (Horneman, 1993). Coaching and training seem to produce more skilful workers and greater levels of sporting prowess.

Compulsory training has been advocated, and in some jurisdictions required (eg Austria and Germany), in the belief that increased driving skill/knowledge should lead to reduced casualty accident involvement (eg in Quebec, Canada in the 1980’s - Potvin, 1991). The recommendation of compulsory training particularly for learner and novice drivers is common in Australia and elsewhere (Watson, 1997). For example, more than 80% of respondents to a 1991 Gallup Poll survey in the UK supported compulsory driver training for learner drivers (Quimby, Downing & Callahan, 1991). More recently, a NRMA survey of young NSW drivers aged 16-24 found that 85% of respondents agreed or strongly agreed that driver education should be compulsory for all young drivers (NRMA, 1997).

Letters to the editor in major newspapers and articles in the motoring sections of newspapers and magazines frequently recommend driver training as a road crash countermeasure (eg journalist Peter McKay, in an article title “Risky Business”, *The Sydney Morning Herald*, 2 January 1999; Russell, 1999). This seems to be based on the assumption that skills and knowledge imparted via driver training programs will somehow generate improvement in the on-road behaviour of drivers and lead to lower crash risk/involvement. As will be discussed below, this assumption may be false.

It is of note that those who attend driver training usually enjoy it and often rate it above other forms of road safety programs aimed at crash reduction (VTI, 1990). This further encourages popular support for driver training.

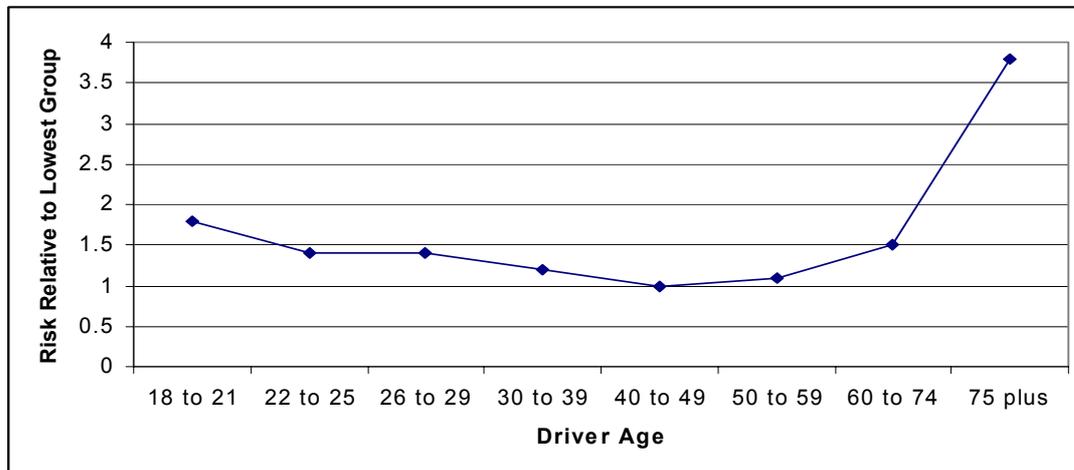
2.4 Driver Age, Experience and Road Crash Involvement

First year drivers in Victoria have about three to five times the casualty crash involvement risk of more experienced drivers (Cavallo & Triggs, 1998). Most of these new drivers are also young – aged around 18-19 years. Youthfulness and inexperience tend to run in parallel for most new drivers.

It is clear that both driver age and experience – or inexperience - contribute to crash risk and involvement. This is a common finding of research conducted in Australia, USA, Canada, UK and Sweden (Levy, 1990; Drummond & Yeo, 1992; Maycock, Lockwood & Lester, 1991; Mayhew & Simpson, 1995; Gregersen & Bjurulf, 1996). As drivers accumulate greater age (maturity) and experience, crash risk decreases, with drivers aged 40 to 49 years having the lowest crash risk per distance travelled. Figure 1 shows the relationship between

age and casualty crash risk in Victoria when compared to the lowest risk group – the 40-49 year old drivers. This “bath tub” shaped graph, higher at both ends and flatter in the middle, is typical of the pattern for drivers in Australia and overseas.

Figure 1. Risk of Driver Being Involved in a Casualty Crash, Victoria (1994-1998 casualty data, 1994 travel data: source - Vicroads, 2000)



Both increasing age and experience contribute to reduced crash risk – at least until about age 60 years when declines in functional ability increase. Research has attempted to quantify the relative effects of age from those of experience. Maycock et al (1991), in a study of British drivers initially licensed to drive at different ages (ie 17, 20, 25, 36 and 50 years respectively) who travelled about 12,000 kilometres per year, found that crash risk during the first few years of solo driving decreased by about 31% due to age and about 59% due to experience. Other studies have shown that all new drivers, regardless of age, have a higher initial crash risk, but the youngest drivers (eg those aged 15-17 years) have the highest risk (Levy, 1990; Cooper, Penili & Chen, 1995). Gregersen & Bjurulf (1996) summarise the research on age, experience and crash risk as follows:

...it seems that experience as well as age related factors are of vital importance. It also seems clear that experience is of greater importance than age, at least from 17 years of age. (p231)

Thus, jurisdictions which allow licensing below the age of 18 in Australia and overseas have a proportionally greater young driver crash risk problem due to age effects and increased exposure given that many 15,16 and 17 year old drivers are on the road as solo drivers. For example, when Canada reduced its minimum driver licensing age to 16 years from 18, the crash involvement among new drivers increased by 12% and fatalities by 24% (Gaudry, 1987 cited in Gregersen & Bjurulf, 1996). Anything that encourages earlier driver licensing also increases crash risk (Gregersen, 1997). As will be discussed below, driver training for learner and novice drivers may contribute to increased crash risk by encouraging early driver licensing.

The degree to which driver training can address the negative influence of driver age and experience on crash risk and involvement is probably limited. Lynam (1995) estimates that in UK and Europe, the best casualty crash reduction available via novice driver training was of the order of 5-10% of current levels because training has not been shown to modify the attitudes or higher order (cognitive and perceptual) skills of novice drivers.

It is unlikely that driver training can substitute for experience or maturity. A recent study by Christie & Fabre (1999) on the feasibility of “fast-tracking” young Australian truck and bus drivers through the ascending heavy vehicle classes concluded that age and experience factors could not be compensated for via careful selection and/or training.

3.0 THE EFFECTIVENESS OF DRIVER TRAINING FOR LEARNER DRIVERS

Learner drivers at the pre-licence level have long been the target of driver training efforts of various types ranging from simple one-to-one instruction to elaborate mandatory programs within driver licensing programs (Saffron, 1981; Christie, 1996; Watson, Fresta, Whan, McDonald, Dray, Beuermann, & Churchward, 1996). The following section summarises research findings on the effectiveness of training at the pre-licence level in crash reduction terms.

3.1 Basic Driver Training in Support of Initial Licensing

Basic driver training works at an instructional level in that most people who are initially trained to drive by a driving school, friends or relatives or a combination thereof achieve licensed driver status. Overall, about 85-90% of the Australian adult population hold a driver licence for at least a motor car. However, this type of driver training concentrates on basic car control skills and road law knowledge. It is heavily oriented towards initial driver licensing (McKnight, 1992). Thus initial training takes someone from non-driver status to licensed status and provides the basic skills on which all higher order driving skills are built.

It is of note that the post-licence crash experience of those trained via commercial/professional instructors and those trained by parents, relatives or friends tend to be much the same. Comparative studies in Europe and Scandinavia reported in Lynam & Twisk (1995) (eg Gregersen, 1994 (Sweden); Keskinen et al, 1992 (Finland); Glad, 1988 (Norway)) found no statistically different post-licence crash involvement for professionally trained and non-professionally trained novice drivers. This has led to countries such as Norway, Sweden and Finland which had maintained mandatory professional training regimes for novice drivers, relaxing the restrictions on non-professionals training learner drivers. However, Finnish research did show that older novice drivers (ie those aged 21-50) exposed to mandatory training had lower post-licence crashes, but this was largely cancelled out by the increases in crash involvement for trainees aged below 21 years (Lynam, 1995). Relaxation of mandatory training requirements does not appear to have adversely affected the safety of young drivers in Nordic countries Norway or Finland and Denmark with both countries showing downward trends in first year driver crash rates across the late 1990's (Statistics Norway, 2000).

Brown (1997) noted that, in respect of UK research, the level and variety of traffic experience is generally lower in professional instruction (eg little experience in overtaking or lane changing). He also noted that the breadth and depth of experience received by learners when supervised by friends or relatives is generally greater. Greater levels of supervised experience during the learner period, as will be discussed later in this report, have been shown to result in reduced post-licence crash involvement in Sweden (up to about 35%) (Gregersen, 1997). Work by Gregersen (1994) in Sweden showed that encouraging cooperation between driving schools and parents in the training of learner drivers may be beneficial in increasing the quality of instruction and the breadth and depth of learner driver experience. Gregersen suggests that systematic cooperation between parents, learners and driving instructors may produce the best result for novice drivers in terms of reduced crash risk. Progressive driver trainers and road safety bodies such as RACV, VicRoads and the Transport Accident

Commission (TAC) are working with parents and novice drivers to increase pre-licence experience levels among beginning drivers.

Initial driver instruction plays an important role in developing basic car control skills and imparting road law knowledge, but it does not guarantee safe or crash free driving on the part of those trained. There is little evidence that pre-licence training per se reduces crash rates among novice drivers in the short or longer term (Henderson, 1991; McKnight, 1992; Lourens, 1993; Twisk, 1994). It is of note that, without any further training intervention, the majority of drivers rarely have collisions with other vehicles, lose control of their vehicles or collide with pedestrians. As shown in Figure 1., drivers also tend to get relatively safer with age and experience, at least until they are aged in their 60's. Even among the highest risk group, probationary drivers, less than 5% will be involved in a casualty crash where they or others are killed or injured.

3.2 Mandatory Pre- Licence Training

As noted above, some jurisdictions have required learner drivers to undertake mandatory driver training courses as a pre-requisite to initial driver licensing. Norway introduced such a requirement in 1979 with theoretical and in-car training involving skid avoidance and car control on icy roads. The course, referred to as “slippery conditions” training, had high face validity as Norway is prone to icy road conditions for long periods of each year, even in non-Arctic areas.

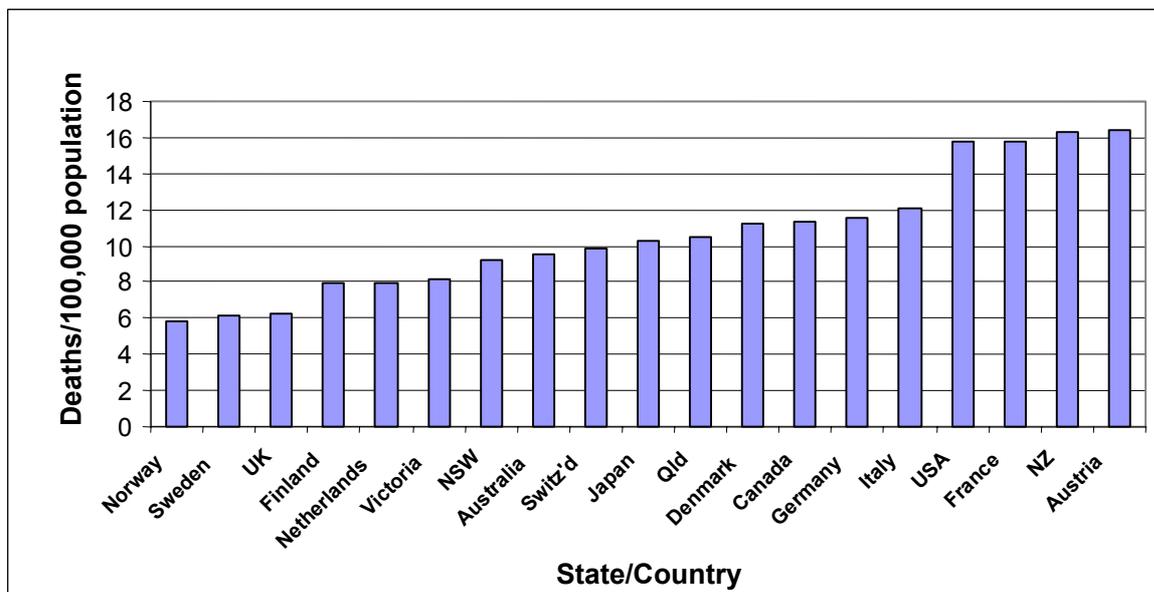
A large scale study of both the theoretical and practical driver training for novice drivers in Norway found no significant difference between the violation/accident records of those who were trained and a matched control group who did not complete the training (Glad, 1988). The study also found a significant increase in skid-related accident involvement among young males who had completed the training course relative to the control group. It was speculated that the training increased the confidence of trainees beyond their actual level of driving competence – a common finding of such research (Christie, 1996; Gregersen, 1996). The results of the study were of concern to the Norwegian authorities who eventually modified and reduced the “slippery conditions” course, but curiously did not remove it completely (N.P Gregersen, personal communication, March 2001). Of interest, however, was that a night-driving training component did lead to significantly reduced post-licence crash levels at night for novice drivers (Glad, 1988; Lynam, 1995).

As a result of the Glad (1988) study, in 1994-95 Norwegian authorities reduced compulsory theoretical and practical pre-licence training. Evaluation showed that this had no significant effect on accident risk for young/novice Norwegian drivers (Institute of Transport Economics (TOI), Norway, 1998). The evaluation also showed that private training and supervision of learners increased following the reduction in mandatory training requirements.

Another major evaluation of mandatory driver training for learner drivers in Quebec (Canada) from 1983-90 also found that these measures had no accident reduction effect on the post-licence risk of accident or on the mortality/morbidity rate per accident of new drivers (Potvin, 1991). Indeed, the program encouraged earlier licensing, particularly among young women. This contributed to an increase in fatal accidents involving young female drivers. The compulsory program was eventually removed on the strength of this evidence and subsequent research (Dussault, 1998; Maag, Laberge-Nadeau, Dione, Desjardins & Messier, 1999).

Levy (1990) analysed nine years of crash data from 47 US states, found that small accident reduction effects reported for compulsory pre-licence driver education programs (high school Driver Education) were likely to be more than offset by increases in risk due to earlier/increased licensure among young people. It is important to note that most high school driver education conducted in the USA enabled trainees to obtain a full driver licence at 16 years. Without completion of this training on a voluntary or compulsory basis, the normal minimum licensing age was 18 years (Palmer, 1995). In-car training within US high school driver education programs was usually conducted on road, but some programs also included some off-road (driving range) instruction.

Figure 2: Road related deaths per 100,000 population: Victoria, NSW, Queensland, Australia and selected countries 1997 (source - Mooren & Moran, 1998)



Compulsory pre-licence training in Austria (40 hours of theory and 20 hours of practical on/off-road training) has failed to produce post-licence crash reductions among those trained (Lynam & Twisk, 1995; Russell, 1999). However, the program continues despite this finding. It is of interest that Austria's road fatality rate per 100,000 population (a typical international measure) was almost twice that of Australia in 1997 and double that for Victoria - ie 16.4, 9.5 and 8.2 respectively (Mooren & Moran, 1998). This is clearly evident in the graph at Figure 2. Australia, NSW, Queensland and Victoria are also fairing better than other countries such as Germany and France who also have mandatory training for novice drivers.

Thus, even well meaning mandatory training for novices does not seem to reduce crash risk. It also has the unwanted side effect of encouraging earlier licensing which in turn exposes young people to the risks of solo driving sooner than they might otherwise have been. This potentially negative link between the effects of imposing compulsory driver training and increased exposure to risk among novice drivers is important for policy makers, training providers and parents to bear in mind.

3.3 Voluntary Pre- Licence Training

Voluntary pre-licence programs, often provided by, or in conjunction with, secondary schools have been common in the USA and Canada (Palmer, 1995), but perhaps less so in Australia

and New Zealand. These programs typically comprised a classroom or theory component and an in-car segment conducted off-road, on-road or both. A number of scientific evaluations of the effects of such training on post-licence crash and violation involvement have been conducted over the last 30 years. The results of six of these – two from the USA, three from Australia and one from New Zealand are summarised below. There are, of course, other studies (see Horneman, 1993; Christie, 1996; Mayhew & Simpson, 1996; Woolley, 2000), but these provide a reasonable cross-section of scientifically based studies across the last two decades.

3.3.1 *Evaluation of the Safe Performance Secondary School Driver Education Curriculum (USA) – The De Kalb County Study*

In the late 1970's, the US National Highway Traffic Safety Administration (NHTSA), US Department of Transportation, commissioned a major study to evaluate the crash reduction potential of high school driver education in the USA. This large-scale trial (known as a demonstration project) compared the crash reduction effects of two types of high school driver education against a matched control group. Conducted in De Kalb County, Georgia, with a sample of more than 16,000 novice drivers, this study is still the most extensive crash-based evaluation of driver training ever undertaken. NHTSA considered this study to be a definitive assessment of the accident/violation reduction effects of novice driver training. The evaluation was conducted and reported for NHTSA by Stock, Weaver, Ray, Brink & Sadof (1983).

Two types of training program were compared, a “best practice” version prepared for NHTSA and one that represented the minimum duration of programs conducted in US high schools. The former, known as the Safe Performance Curriculum (SPC), comprised 32 hours of classroom instruction, 16 hours of instruction on driving simulators, 16 hours of off-road (driving range) instruction and about 3.5 hours on-road instruction. The second program, known as the Pre-Driver Licence Curriculum (PDL), comprised 20 hours of combined classroom, simulator and driving range (off-road) instruction plus one hour on-road, instruction, supplemented by on-road, supervised driving with parents. The SPC greatly exceeded the total duration and behind-the-wheel time of typical US high school programs while the PDL was shorter and had less in-car time than the norm.

The control group received no high school driver education and received pre-licence instruction from parents, friends or commercial driving instructions.

Students were randomly assigned to either the SPC, PDL or control group from a pool of volunteers who wished to get their driver licence as soon as eligible. All were matched as closely as possible on gender, parental socio-economic status and their academic performance at school. The training phase took place over a 30-month period and was followed by a 4-year post-licence-monitoring period where the crash and violation records of the SPC, PDL and control groups were collated and analysed.

Stock et al (1983) found no significant statistical difference between the SPC, PDL and control groups overall in respect of crash or traffic violation rates (per distance travelled). An apparent short term effect was reported whereby those in the SPC and PDL groups had lower crash and violation rates in the first six months of solo driving. Reanalysis by Lund, Williams & Zador (1986) showed that this short term effect was more than fully offset by members of the SPC group becoming licensed sooner and having significantly more traffic violations relative to the control group. Lund et al (1986) concluded that driver education/training had no crash reduction

effect and contributed to increased violation and crash involvement for novice drivers by encouraging earlier licensing among those trained.

The results of the De Kalb County study have been debated in the literature over the last 15 years with driver training advocates claiming bias and training opponents seeing the results as clear evidence that novice driver training is ineffective and probably detrimental (Palmer, 1995). The greatest effect the study has had is to reduce government funding for high school driver education and the proportion of US high schools offering programs. For example, while about 80% of US high schools conducted driver education programs in the early 1980's, this had fallen to about 50% by 1990 and has fallen to below 40% since (Palmer, 1995; McKnight, personal communication, May 2001). The study also encouraged authorities in Australia and New Zealand to conduct evaluations of novice driver training programs and to question the crash reduction value of driver training.

3.3.2 *Comparison of On-Road and Off-Road Driver Training for Novice Drivers in Victoria – The Goulburn Valley Study*

Interim reports on the De Kalb County study published before 1983 sparked considerable debate in Victoria about the legitimacy of government funding for novice driver training, particularly that conducted at off-road facilities such as the Goulburn Valley Driver Training Centre (now part of the Driver Education Centre of Australia or DECA) located at Shepparton in central Victoria. Off-road facilities are costly- to build and maintain – US research in the 1970's showed that off-road training was about 150% more expensive than that conducted on-road, particularly when building and maintenance costs were considered (Council, Roper & Sadof, 1975; Dreyer & Janke, 1979).

Strang, Deutsch, James & Manders (1982) reported the results of a study undertaken by the Road Safety and Traffic Authority (RoSTA), the predecessor of VicRoads, to evaluate the effect of range (off-road), non-range (on-road) and informal pre-licence driver training on the post-training crash and violation patterns of novice drivers.

The study involved about 800 young male learner drivers (about 17 years old). Learner drivers who had volunteered to take part in the program were randomly assigned to one of four groups, including a control group. Details of these groups were as follows:

- Group 1 received some on-road training (two hours), but mainly off-road training – training extended over four days and was composed of five hours behind-the-wheel, six hours as an observer of other students or instructors and 11 hours of classroom instruction on road law and safe driving.
- Group 2 received the same amount of in-car, behind the wheel time as Group 1, but all took place off-road.
- Group 3 received the same amount of behind the wheel training as Groups 1 and 2 - all of this occurred on road with RACV driving school – and a two-hour lecture on road law and safe driving.
- Group 4, the control group, received no formal or organised training at all.

All groups were assessed in respect of driving skill, road law/safe driving knowledge and attitudinal factors at the conclusion of the training phase. All three trained groups scored significantly higher in respect of road law and safe driving knowledge relative to the control

group. The two off-road trained groups did not differ on attitude scale scores, but both were significantly better (more positive) than the control or on-road groups.

A two year follow-up showed no statistically significant differences between any of the groups in terms of crashes, convictions or exposure-to-risk (ie distance travelled each year). Given this lack of worthwhile crash or violation reduction effects, the results of the study led to the near elimination of government funding for the construction, maintenance and/or operation of off-road driver training centres, particularly those associated with secondary schools (Woolley, 2000).

3.3.3 *Evaluation of the New Zealand Automobile Association (AA) Driver Training Program*

Wynne-Jones & Hurst (1984) evaluated the New Zealand Automobile Association (AA) driver training program conducted in secondary schools. This program was conducted largely during school hours for students aged 15-18 years – the minimum driver licensing age in NZ was (and still is) 15 years of age. The course consisted of 16 hours of in-car instruction – eight behind the wheel and eight as a passenger when others were being instructed - twelve hours of classroom instruction on road law, attitude and basic motor mechanics supplemented by supervised practice between formal instructional sessions. Students undertook the NZ driver licence test at the conclusion of the training program. At that time the licence issued allowed unrestricted solo driving and was similar to a full licence.

The 788 students from 23 schools taking part in the evaluation were randomly assigned to the training or control groups and matched as closely as possible on demographic variables (eg age, gender and distance driven post-training). Analysis of crash and violation involvement 18 months post-training showed no significant reduction in crash involvement or traffic offences for those trained - relative to matched controls- but significantly earlier licensing among those trained, particularly for females.

3.3.4 *Further Evaluation of the Tasmanian Pre-Driver Education Program*

Langford (1998) published the results of a further evaluation of Tasmania's Pre-Driver Education program conducted in secondary school as an elective or as a School Certificate (Year 10) subject. An evaluation report had been published the previous year (Langford, 1997) – a summary also appeared in a special edition of NRMA's *Today* journal (Langford, 1997a).

The Tasmanian Pre-Driver Education is offered as two components. The first is a 12 x one-hour duration classroom based program conducted by government road safety officers covering defensive driving and basic driving topics. The second component, a further 12 x one-hour duration series is conducted by secondary teachers and addresses responsible road user behaviour, centred on drink-driving issues. In some schools these components are supplemented by some off-road, in-car instruction (average behind-the-wheel time about 30 minutes). Where only the first component is taken, students take the learner licence test at its conclusion and a classroom-based test on defensive driving. Where both components are taken, students are allowed to count the course as an official School Certificate (Year 10) subject.

Langford (1997) reported the results of a retrospective study that matched the licence and crash data of drivers that had completed or had not completed Pre-Driver Education in Year 10 (as an elective or as a formal subject within the School Certificate). Overall, retrospective matching

linked about 67% of about 34,000 students for the period 1987-94 to licence and crash data records up to mid 1996.

Langford (1997) reported that those who completed pre-driver education, as an elective or School certificate subject, gained their licence at a statistically significantly earlier age relative to those who had not taken the course. At the end of a cumulative three-year post licence period, there was no significant difference between the crash records of students who had undertaken the two types of pre-driver education. However, students who had not taken pre-driver education recorded modestly higher levels of casualty crash involvements during the same period – these were statistically significant. This was initially interpreted as positive results in favour of pre-driver education, albeit with some reservations relating to the retrospective design and inability to match about one third of driver records.

Further analysis of the data by Langford (1998) improved the retrospective matching of the sample of about 34,000 students for the period 1987-94 to licence and crash data records (up to mid 1996) to about 86%. However, statistical analysis failed to support the findings of the earlier study. No statistically significant differences in crash involvement at the end of a cumulative three-year post licence period were found between drivers who had completed pre-driver education of either type and those who had completed no pre-driver education. The results of the 1998 further analysis were also reported in a conference paper (Langford, 1999). Langford (1998) noted the methodological difficulties of both the original and the further analysis, but concluded somewhat optimistically that:

... the issue of possible road safety benefits arising from driver education delivered in Tasmania 1987-1994, remains open at least until ... further investigated within a strengthened empirical framework. (p23)

3.3.5 Evaluation of a Pre-Driver Education Program Conducted at Rural Secondary Schools in Victoria

Publication of the findings of the De Kalb County study (Stock et al, 1983) and the Goulburn Valley study (Strang et al, 1982) led to a marked decline in funding and policy support for pre-driver education/training in secondary schools that included in-car, off-road components. However, some secondary schools, particularly those in rural areas, continued to offer in-car, off-road components within pre-driver education programs.

In 2000, Haworth, Kowaldo & Tingvall published a retrospective evaluation comparing the accident and traffic offence records of drivers who had completed pre-driver education at rural secondary schools that included an in-car, off-road component with those of drivers that had completed programs with no in-car component or had not completed a pre-driver education program at school. The researchers sent 2,000 self-report questionnaires to 2,000 drivers aged 18-29 years in two rural Victorian electorates (Mallee & McEwan) and received 687 responses. These electorates covered the catchment areas of those schools providing the programs of interest. Haworth et al (2000) noted the shortcomings in the self-report, retrospective design, including the lack of a true control group and other biases that may have affected the representativeness of the results.

Analysis of the returns showed that respondents who completed programs incorporating an in-car component obtained their learner permits and probationary licences earlier (at a younger age) than the comparison group. However, unlike other studies, no statistically

significant differences were found in respect of accident or offence record or in respect of most measures of driving-related attitude or behaviour. The authors noted that this may be due to earlier licensing for participants in the study leading not to solo driving but to supervised driving on a learner permit.

3.3.6 *Evaluation of Pennsylvania's Driver Education Program - The PennState Study*

Researchers from the Pennsylvania Transportation Institute, Pennsylvania State University (PennState) were commissioned by the Pennsylvania Department of Transportation to evaluate the effects of driver education conducted at pre-licence level on post licence crash and traffic violation among novice drivers aged 16-18 years. This was part of larger task force effort by Pennsylvania transport and education authorities on developing ways of reducing 16-17 year old casualty crashes in Pennsylvania. The study looked at the effects of driver education (training) provided at school, (classroom and/or in-car components) or via commercial driving schools (classroom and/or in-car components). The results of the study are contained in McKenna, Yost, Muzenrider & Young (2000).

The research team interviewed a random sample of about 1,200 drivers aged 16-18 years regarding their driver education, conviction and crash records – information on 16 variables, including personal demographics (eg age, school grades and sex), were collected. The details of these drivers were then matched against official conviction and crash records held by the Pennsylvania Department of Transportation. Within the sample, 57% had taken high school driver education, 13% had driving school instruction and 34% reported no formal driver training. The researchers also interviewed a sample of driver trainers and instructors involved in the driver education program about their views on driver education.

McKenna et al (2000) summarised the results as follows:

...the present study has shown no evidence that driver education in Pennsylvania leads to lower rates of crashes or convictions among young drivers. Furthermore, a review of prior research elsewhere has shown that there is no evidence that driver education leads to lower rates of crashes or fatalities among young drivers. (pvii)

Statistical analysis showed driver education at school or with a commercial instructor, with or without behind the wheel training, was not related to young driver crash risk or violations. In respect of those that had completed school-based driver education, analysis showed:

- no lower crash rate;
- no lower conviction rate;
- no demonstrated change in seat belt use;
- no lower rate of risk-taking behaviours; and
- no lower rate of crash severity or injuries.

McKenna et al (2000) noted that higher school grade performance was statistically related to lower crash rates. Females also had significantly lower traffic convictions. Interestingly, drivers who made their own car loan repayments had significantly higher crash and conviction levels. Survey results showed that most (about 75%) of the sample thought that all students should take driver education. However, only 25% thought that it would reduce their crash risk – most saw it

as a way of becoming licensed more easily. By contrast, most of the instructors interviewed believed that driver education should be mandatory and would reduce crash rates.

The cost of providing driver education in Pennsylvania's high schools was estimated at \$US43.23 million per annum (excluding start-up costs or Department of Education internal costs) or about \$US350 per driver. Given that the program did not return crash or violation reductions, the merits of spending this considerable sum on driver education is highly questionable. The Pennsylvania driver education program would have to prevent about 15 fatalities each year just to break-even in benefit-cost terms – a US transport related fatality is valued at \$US2.9 million (Bureau of Transport Economics, 2000).

3.4 Off-Road or On-Road Driver Training for Learner Drivers?

Members of the public and the media often advocate the building and operation of off-road training centres for novice drivers. This is often based on the premise that it is safer to learn and perhaps make mistakes in an off road environment and that vehicle handling skills such as skid control can be taught safely. However, there is little scientific evidence to support this view. (RTA, 1996; Christie, 2000). On the contrary, 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 (Mayhew & Simpson, 1995).

It is of note that learner drivers under supervision have a low risk of crash involvement, probably the lowest of all driver groups (VicRoads, 1998). In addition, the risk of skidding or losing control of the car – a common theme of conventional off road driver training - is low with less than 5% of all police reported crashes in NSW and Victoria per year resulting from such circumstances. This low probability makes training for such eventualities unwarranted on educational and probability grounds for most drivers, including novices. As researchers have found, drivers quickly forget skills that are not often needed or practised (Christie, 1996). This further highlights the benefits of on-road training over the use of off-road training facilities.

3.5 Lack of Research Support for Off-Road Training

As noted earlier in this report, scientific evaluations of off-road novice driver training in Australia, Norway, Sweden, USA and Canada over the last three decades have shown no worthwhile crash reduction effects relative to on-road programs (eg Strang et al, 1982; Haworth et al, 2000). However, some have shown such training may lead to an increase in accident involvement through increased confidence and optimism bias, particularly among young males, (Sowerbutts, 1975; Glad, 1988; Gregersen, 1996; Mayhew, Simpson, Williams & Ferguson, 1996; Potvin, 1991). Even theoretically sound programs combining on-road and off-road training aimed at reducing the over-confidence and optimism bias of novice drivers aged 18-25 years have been ineffective in changing the behaviour of novice drivers in Sweden (Nyberg & Engstrom, 1999) and the Netherlands (Goldenbeld & Hatakka, cited in Siegrist, 1999).

3.6 Off-Road Facilities are Expensive to Build, Operate and Maintain

Off-road facilities are expensive to build, operate and maintain. As noted earlier in this report, Council et al (1975), in an early US comparison of on-road and off-road training for novice drivers, concluded that off-road training was about 150% more expensive than that conducted on-road. Dreyer & Janke (1979) in a later US study comparing off and on-road training for novices, reported that off-road training was operationally cheaper, but that this situation reversed when construction and maintenance costs were considered. Similarly, Strang et al (1982) noted, in their comparison of off- road and on-road driver training for novices in Victoria, that the cost per trainee was higher for those trained off-road.

At another level, such off-road facilities may also divert scarce funds away from more effective initiatives and countermeasures. Progressive off-road driver training centre operators have learned from the research literature and moved their operations from novice driver car training to focus on fleet, commercial and vocational driver training within a transport industry context (eg DECA Training and those affiliated with the TAFE network). Such programs have a place in making the road transport network safer, however, their focus has moved from road safety per se towards vocational training combined with an occupational health and safety focus (Christie, 1996; 2000),

3.7 Novice Drivers Need On-Road Experience

The accumulation of an on-road “experience bank” is perhaps the major potential contributor to reduced crash risk in solo driving and is supported in the road safety research literature (Mayhew & Simpson, 1995; Gregersen, 1996). Swedish research suggests that it contributes to post-licence reductions in casualty crashes of up to 35% for novice drivers (Gregersen, 1997).

Programs in Victoria, NSW, Canada and Sweden promote the accumulation of supervised driving experience under a variety of traffic situations. For example, the VicRoads publication, *Getting there from Ls to Ps: A Step-by-Step Guide for Learners and Supervising Drivers* (VicRoads, 1998) shows how supervising drivers, often parents, can assist learner drivers to build this protective bank of experience. The accumulation of supervised experience is also promoted in supporting media advertising by organisations such as the Transport Accident Commission (TAC). In jurisdictions such as Victoria, the learner permit (learner licence age) has been reduced to 16 from 17 years to encourage novices to gain substantial and varied supervised on-road experience prior to solo driving. However, in Victoria, minimum driver licensing age remains at 18 years.

3.8 Concluding Comments on Pre- Licence Training

The above discussion, together with extensive reviews of the literature, suggest that, beyond imparting basic car control and road law knowledge skills, pre-licence driver training/education contributes little to post-licence reductions in casualty crashes or traffic violation among novice drivers. There is also considerable evidence that driver training, including off-road training, that attempts to impart advanced skills such as skid control and advanced vehicle handling may contribute to increased crash risk, particularly among young males. In addition, mandatory pre-licence training or even formal pre-licence training/education, may contribute to increased exposure-to-risk for young drivers, particularly females, by encouraging early solo licensing (Roberts, Kwan & the Cochrane

Injuries Group Driver Education Reviewers, 2001). This pattern of results has been confirmed and replicated across numerous studies conducted in Australia, New Zealand, North America, Europe and Scandinavia during the last 30 years. Mayhew & Simpson (1996) summarise the situation as follows:

The review of scientific evaluations performed to date provides little support for the claim that driver instruction is an effective safety countermeasure. The overwhelming preponderance of evidence fails to show that formally trained students have a lower frequency of crashes than those who do not receive such training. Even worse, a few studies have shown a safety disbenefit of driver education/training. The harsh reality is that driver education/training programs have been evaluated and have not reduced crash risk of young drivers and, therefore, the safety value of such programs remains unproven. There is some evidence that at least some driver education programs can successfully teach driving skills and impart knowledge, but skills and knowledge acquired in training do not necessarily produce driving behaviour that leads to reduced crash involvement. (*Executive Summary*).

4.0 THE EFFECTIVENESS OF DRIVER TRAINING FOR YOUNG AND/OR RECENTLY LICENSED DRIVERS

4.1 Introductory Comment

The majority of the training effort directed to novice drivers has been at the pre-licence level, few programs specifically target novices in the first few years of solo driving. However, some young/recently licensed drivers will seek out and attend commercial post-licence driver training on their own initiative or on the advice of parents, relatives or friends who believe that this may improve their driving skills and reduce crash risk. At face value, this has some intuitive appeal as novice drivers are at greatest crash risk in the first six months of solo driving (VicRoads, 2000).

4.2 Defensive and Advanced Driver Training Taken by Novice Drivers

Two early Australian studies of post-licence driver training (Sowerbutts, 1975; Perry, Strang & James, 1978) found that inexperienced drivers under the age of 25 years, particularly males with an interest in cars and driving, were attracted to skill-oriented, advanced driver training courses in Sydney and Melbourne. Sowerbutts (1975) found that the post-course violation records of course attendees were worse following course attendance.

A study of a mixed defensive/advanced driver training course for novice drivers in Adelaide found no statistically significant differences in post-training crash involvement for those who attended the training and those who did not (Holubowycz and McLean, 1980). Participants and control group members were apprentices employed in the automotive industry in the greater Adelaide area.

Payne, Brownlea & Hall (1984) in an evaluation of the Queensland Defensive Driving Course (DDC) – then conducted by the Queensland Department of Transport – concluded that the program did not reduce crash involvement for 17-19 year old drivers relative to untrained controls. It should be noted that the course was aimed at all drivers and that novices did not represent a large proportion of DDC clientele. Payne et al also concluded that course attendance may be detrimental to novice drivers due to increasing self-confidence about their driving ability. The findings of this study, and reports in the international literature, led Queensland Transport to devolve the delivery of the DDC to external providers and to pursue other approaches to novice driver development and management (Watson, 1994).

This maintenance or increase in self-confidence and optimism bias has been reported as an undesirable effect of driver training taken by novice drivers (Lynam & Twisk; 1995; Mayhew & Simpson, 1996; Woolley, 2000). Some training programs targeting young, novice drivers have attempted to address this.

4.3 Training Targeting Higher Order Skills and Optimism Bias in Novice Drivers

Conventional driver training appears to be ineffective in reducing crash risk, and may actually contribute to increased risk for new drivers. In light of this, researchers and developers have been experimenting with ways of addressing the development of higher order perceptual/cognitive skills, the reduction of risk taking and ways of countering over-

or provide insight that novice drivers still had much to learn. Overall results were summarised as follows (Goldenbeld & Hatakka, cited in Siegrist, 1999):

When asked about their driving skills, quite a large number of participants said that they considered their driving skills to be better than those of the average experienced driver. This shows that the course did not contribute to the realization that drivers need to learn for many years before they are experienced. Attitudes after the course indicated that more participants felt that they had better control of the car. (p178)

On the basis of these outcomes, one could argue that the course may have in fact strengthened or confirmed optimism bias among those trained.

4.4 Other Approaches to Post-Licence Training of Novice drivers

Post-licence programs for novice drivers with similar aims to the Insight, though perhaps different content have been conducted in Finland and Germany (Lynam, 1995). Evaluation of a post-licence support scheme for novice drivers (“Young people driving safely program”) in Germany - comprising provision of written information on safe driving, group discussions and group drives – failed to show significant improvement in attitudes, or reductions in accident/violation levels relative to those completing conventional driver training (Lynam, 1995).

The Finnish program, introduced in 1991 as part of the “temporary” licence phase for new solo drivers (similar to a provisional/probationary licence phase), involves novices taking 4 hours of training with an instructor and deals with risk avoidance and speed control six to 24 months after initial licensing. Preliminary evaluation of this program suggests that it contributed to a significant reduction in crashes, particularly among males, but had less impact on females (Keskinen, Hatakka, Katila, Laapotti & Peraaho, 1999). While novice drivers under this new program tended to drive less than those exposed to the former training approach and a downward trend in crashes for all drivers was experienced in Finland, Keskinen et al (1999) concluded that the new approach contributed to statistically significant reductions in crashes among novice drivers.

A recent Australian study (Martin & Horneman, 1998) investigated the potential for post-licence driver training for novices to address undue optimism, confidence and a mental approach to driving. The study compared three groups of recently licensed drivers who completed traditional and more cognitively-based training courses in the greater Sydney area. Results showed some significant differences in attitudinal and judgement factors between those trained via the cognitively-based approach aimed at reducing optimism bias and overconfidence and those in the more conventionally trained group. However, methodological limitations in the design of the evaluation, acknowledged by the authors, prevent the results being generalised beyond the study itself.

4.5 Concluding Comments on the Effectiveness Of Driver Training For Young and/or Recently Licensed Drivers

As with other areas of novice driver training, there is no clear evidence that post-licence training for novice drivers leads to reductions in crash or violation involvement (Mayhew & Simpson, 1996). From a theoretical perspective, there is support for the development and application of training that targets optimism bias, over-confidence and

attitudinal/motivational factors that influence safe driving behaviour (Lynam, 1995; Mayhew & Simpson, 1996; Gregersen 1997; Woolley, 2000). However, there is little evidence thus far that this type of training reduces crash/violation risk among novices as few crash-based studies of these newer approaches to training have been completed. While there is a temptation to view improvements in measured attitude, behavioural intention and insight factors as evidence of positive effect, the lack of a clear relationship between such measures and actual driving behaviour (Elliot, 1992) suggests that one should be sceptical until the actual effect on crashes and violations is known.

There is also the view that training for novices, beyond basic-pre licence training, is limited in its capacity to shape and change driver behaviour (Harrison, 1998). However, as Woolley (2000) concludes at the end of an extensive review of in-car driver training, there is considerable faith in driver education and training that persists even in the face of evidence to the contrary:

Existing courses and reports proposing “new thinking” directions for driver education at present do not seem to adequately address the more complex behavioural and attitudinal issues and still hold in high regard the ability of driver training and education to make a significant impact on road safety outcomes despite overwhelming evidence to the contrary. (p34)

Alternatives to training such as increased experience at the pre-licence level combined with graduated licensing and on-road enforcement regimes may hold more promise (Lynam, 1995; Mayhew & Simpson, 1996; Harrison, 1998). These alternatives are summarised later in this report.

5.0 THE EFFECTIVENESS OF DRIVER TRAINING FOR EXPERIENCED DRIVERS

5.1 Defensive Driver Training

Evaluations of common programs such as the Defensive Driving Course (DDC), developed, revised many times and still offered by the US National Safety Council, have failed to show reductions in post-training crashes for trainees (relative to those who did not attend) (Lund & Williams, 1985; Dewar, 1991).

The DDC was originally a classroom, lecture-based program that has been augmented with videos, discussion components and sometimes in-vehicle components. It is promoted as a “one course fits all” program suitable for drivers of any age or experience group, including traffic offenders (Kinnan, 1992). In the early 1990’s about 3 million US drivers completed the course each year on a voluntary or compulsory basis.

Training programs targeting drivers known to have been over-involved in accidents and assigned to training programs as a consequence have not returned significant reductions in post-training accident involvement (Brown, Grueger and Biehl, 1987; Struckman-Johnson, Lund, Williams and Osborne, 1989). McKnight & Stewart (1990) noted that most traffic offenders have few driving skill or knowledge deficits and score well on licence retests, concluding that there was little point in using driver training as means of improving their driving performance or behaviour.

Training has sometimes been found to significantly reduce post-training violation involvement for those assigned to training due to committing serious or numerous traffic offences – including at-fault crashes (Brown, Grueger and Biehl, 1987; Struckman-Johnston et al, 1989;). However, there is no reliable evidence that this reduction in violations translates into accident reductions or even persists in the long-term. Struckman-Johnson, et al, (1989) following a review of 65 evaluations of driver improvement training programs (including the DDC) in the USA questioned the road safety value of such approaches as they reduced offences but not crashes.

5.2 Advanced Skills Driver Training

Advanced training aimed at increasing the vehicle control and handling skills of experienced drivers has not been shown to be effective in crash or violation reduction terms (Christie, 1996; Lord, 2000). Chris Brooks, Director of Research Management & Policy, Federal Office of Road safety (now part of the Australian Transport Safety Board (ATSB)) cited in Lord (2000) summarised the research evidence as follows:

...no-one has come up with an evaluation that shows there’s a benefit to advanced skills training...gains from training may be offset by confidence and reduction of safety margins...
(p21)

An interesting early study on advanced skills training by Williams & O’Neill (1974) retrospectively matched the crash and violation records of a sample of 3,000 members of the Sports Car Club of America who held national race licences in Florida, Texas and New York state with non-racing drivers matched for age, sex and annual distance travelled. The average

age of drivers was about 35 years and almost all were male. The researchers found that despite holding a racing licence and being highly trained in vehicle handling /control, racing drivers had statistically significant higher levels of on-road crashes and violations over a five year period.

5.3 Fleet Driver Training

Some driver training providers claim that their programs produce accident reductions, particularly in fleet settings (Christie, 1991; 1996; Lord, 2000). Many of these claims are often based on small samples, testimonials or data derived by non-scientific means. Claims of crash reductions due to training intervention often disappear when the effects of other factors are taken into account.

Manders, (1986) in a scientifically designed study of fleet driver training provided within a large Australian company concluded that training did not contribute directly to post-course crash reductions recorded by the company. Factors such as regression to the mean (a statistical phenomenon where high crash levels tend to come down to average levels over time), changes in company policy, changes in the vehicle fleet and other non-training variables contributed most to crash reductions. However, Manders (1986) concluded that as driver training has high face validity as part of fleet management programs it may indirectly contribute to the overall effectiveness of fleet management programs aimed at reducing accident rates. Later studies within Swedish Telecom came to similar conclusions (VTI, 1990). As Watson (1997) noted:

It has been suggested that post-licence training may be more effective in the fleet setting due to motivational factors (Job, 1995; Watson et al, 1996). For example, fleet management programs typically involve a variety of interventions besides training, including: rigorous recruitment procedures, incentives for improved performance; workplace health and safety improvements; and the provision of a counselling service. In effect, these programs are designed to improve the safety performance of fleet drivers by promoting cultural change within organisations (*Watson et al, 1996*). (p351-352)

Motivational factors are likely to play a greater role in influencing the behaviour of employees when driving fleet vehicles (Lord, 2000). Christie (1991) notes that employers have some control over when and where vehicles are used and who drives them. This can assist in reducing risk. Employee drivers committing traffic offences or crashing fleet vehicles are also more likely to come to the notice of employers. These factors often provide some motivation for employees to drive within the law or company policy for fear of employer sanctions.

An example of a highly effective fleet safety intervention program is that conducted within Swedish Telecom in the late 1980's. (VTI, 1990). The nature and results of this study are outlined below.

5.3.1 *The VTI – Swedish Telecom Study*

In response to 10 work related fatalities over an eight year period, all of which were vehicle related, Swedish Telecom approached the Swedish Road and Traffic Research Institute (VTI) for assistance during 1985. This led to the development and conduct of a project to test four different potential crash reduction techniques using four intervention groups and a control

group drawn from the Telecom workforce. The results of this study may be found in VTI (1990). A summary also appeared in the Nordic Road & Transport Research Journal (No 1, 1991, pages 22-23).

The five groups in the VTI-Telecom study are described below.

Group 1: Driver Education. This group received instruction and practice in skid control and commentary driving – the stated aim was not to increase control skills, but to raise awareness and raise insight about crash risk.

Group 2: Group Discussion. Group discussions involved regular meetings of workers to discuss safety issues and traffic safety improvement measures – the aim was for each driver to formulate a personal goal for better traffic safety. This program was based on a model developed by VTI during previous research.

Group 3: Bonus. Bonus group members received a gift of Swedish Kroner (SEK) 200 (about \$A40) per vehicle. This sum was reduced progressively for each accident that occurred. The amount remaining after 12 months was awarded to the drivers as a group.

Group 4: Campaign. Group members received communication of specific information focussing on various themes on five occasions across the years. These themes were, respectively: Thinking Traffic Safety: An introduction; Autumn, darkness and braking distances; Winter, slippery road conditions; Spring, aspects relating to Telecom and cyclists; Summary, review and repetition.

Group 5: Control. This group received no interventions at all.

Over a period of three years (December 1985 to December 1988 inclusive), VTI compared the crash reduction effects of the four intervention techniques against the control group. Each group comprised about 900 drivers and was matched as closely as possible in respect of driving experience, accident history and location (urban/rural). Data were collected for each group in terms of accident cost and risk. Survey questionnaires were also administered to all participants to gather their views on the particular program in which they participated.

5.3.2 Results of the Study

The results of the study showed reductions in crash rate for the Discussion group (Group 2) and the Driver Training Group (Group 1). Overall, the Group discussion (Group 2) approach produced the greatest reductions per distance travelled and was also the most cost effective - about twice as cost-effective as any of the other conditions. When pre-program accident costs (1985) were compared with those for post-program (1988), the Driver Training group (Group 1) showed a 33% reduction, the Discussion group (Group 2) about a 69% reduction, the Bonus group (Group 3) a 35% reduction, the Campaign group (Group 4) a 34% reduction and the Control group (Group 5) a 15% reduction. The reduction shown by the Control group suggests that Telecom crash rates “regressed to the mean” over the three years of the program.

It is of interest that the Discussion group was almost twice as effective (at half the cost) of any of the other interventions and that Driver Training did no better, in fact marginally worse,

than the Campaign and Bonus groups. Given the popularity of driver training noted above, it was perhaps not surprising that driver training received the highest ratings from participants in the survey questionnaire and was rated higher than the group discussions.

The results indicate that driver training may be beneficial in fleet settings, but that other more economical measures may be more effective. This finding has been noted elsewhere in the literature (Christie, 1996; Watson et al, 1996). To some extent, the VTI-Swedish telecom study has become a model for other fleet safety programs and has provided a rationale to steer employers away from seeking driver training as a remedial measure when crash rates appear to rise (Christie, 1991). Adoption of safe vehicle use policies and practices within organisations who operate vehicle fleets, would appear to have greater potential to reduce, or moderate crash involvement (Christie, 1991; Haworth, Tingvall & Kowaldo, 2000a). Monash University Accident Research Centre's (MUARC) safe vehicle use guidelines represents an example of such a policy (see website –www.general.monash.edu.au/muarc/carpolicy.htm).

5.4 Concluding Comments on the Effectiveness of Driver Training for Experienced Drivers

Reviews of evaluation studies have found no evidence that either advanced or defensive driving courses reduce the accident involvement of experienced drivers who attend them (Saffron, 1981; Henderson, 1991; Christie, 1996; Watson et al, 1996). This is perhaps not surprising as drivers between the age of 25 and 59 years are quite experienced and already have a relatively low crash risk per distance travelled. There is, however, some evidence that some programs may reduce traffic offence recidivism among those assigned to driver improvement programs. This, however, does not seem to translate into reduced crash involvement. Driver training may be more effective in fleet settings, but other more economical measures such as group discussion may be more effective in crash reduction terms.

6.0 DISCUSSION

Many people, including driver trainers, may find it hard to understand why driver training does not seem to lead to accident reductions. After all, the skill and knowledge levels of trainees often appear to have improved at the end of driver training programs or courses. However, these apparent contradictions are not so surprising when one considers driver training and its outcomes in respect of human behaviour, crash probability and examine the content and format of the training usually provided (Christie, 1996; Watson, 1997). The following discussion provides an overview of some of the reasons why driver training may not be effective in reducing road crashes.

6.1 Why does Driver Training not seem to be Effective in Reducing Crashes?

6.1.1 *False Assumptions about Driver Deficiencies and the Merits of Training*

Advocating driver training as a means of improving driving skills and knowledge assumes that there are deficiencies in the skills or knowledge of drivers and that these can be remedied by the application of training. It also assumes that such deficiencies increase the risk of crash involvement. These assumptions are largely false and based on beliefs not supported by the weight of research evidence (Watson, 1997; Woolley, 2000). However, they remain persistent within the community at large.

In-depth scientific studies of vehicle crashes have found driving skill deficiencies to be relevant in less than 5% of crash involvement in Australia and the USA (Treat, 1977; McLean et al, 1979). In a similar vein, road safety research in Australia and overseas over the last two decades has been unable to find clear evidence of a link between car driving skills (or the lack thereof) and road trauma (AAA, 1981; HRSCRS, 1982, Twisk, 1994). This implies that the skill-based driver training typically provided in Australia and overseas that concentrates on braking, swerving and associated crash avoidance skills, even if 100% effective in educational terms, is likely to have little effect on the accident rates of trained drivers. While basic control skills are necessary pre-requisites for safe driving, it is higher order skills (eg hazard perception and insight) that contribute more to reducing crash risk for drivers (Lynam, 1995).

As shown earlier in this report (see Figure 1) most people become safer drivers with age and experience. Australian studies of crashes for young/novice drivers aged 18-25 years old show that it is lack of driving experience, not lack of training that contributes to their higher crash involvement relative to older, more experienced drivers. (Catchpole, Cairney & Macdonald, 1994). This suggests that practice and experience improve skills and competencies without the need for training intervention. However, there is some suggestion that training in specific perceptual and cognitive skills relating to the perception of hazards may be useful (McKenna & Crick, 1992; Catchpole et al, 1994).

While crash risk increases slowly for drivers aged over 55 years this is due mainly to an age-related decline in sensory, cognitive and motor functions and increasing physical vulnerability and frailty (Fildes, 1998; Morris, Brown, Fildes, Corben, Langford & Hull, 1998; Fildes, 2000). It is unlikely that such declines in functioning will be remediated or reversed by driver training per se.

6.1.2 *Asking Too Much of Driver Training in Crash Reduction Terms*

It may be unreasonable to expect an educational or instructional tool such as driver training to deliver crash reductions (Smith, 1983; Woolley, 2000). Christie (1996) noted that expecting driver training to reduce crashes is a bit like expecting the teaching of general economics in schools and universities to be assessed not on the basis of the academic achievement of students but rather on the subsequent state of the economy and the subsequent success or otherwise of students in business and commerce. Despite this, the belief in the efficacy of driver training to reduce crash involvement persists among driver trainers, sections of the media and the public at large (Watson, 1997; Woolley, 2000). Woolley (2000) suggests that it may persist until the perceived relationship between skills-based training and crash outcomes is broken. This appears to be easier said than done.

Palmer (1995) makes a similar point about driver education and training in the USA and goes on to note that there should be some agreement on how the success of driver training should be measured – he suggests reductions in crash rates (ie crashes/casualties per distance travelled) and the absence of increase in distance travelled (exposure-to risk). Palmer notes that many driver training programs lack a clear aim beyond improving “safety” which is too broad a term to be useful in evaluation terms. This causes confusion and argument about what training is for and whether training is effective. As Simpson (1995) notes:

It is time to set realistic safety objectives for driver education and training. A problem that has plagued the evaluation field for many decades concerns the objectives of driver education and training. Often those conducting the evaluations have different expectations than those who have designed or administer these programs. As a consequence, the results of evaluations have been viewed by some as evidence of the ineffectiveness of education/training while others have seen the results as evidence of effectiveness.

At issue, in particular, is the durability of the impact of formal instruction. Are the effects expected to be short-term or longer-term? The field needs to achieve clarity and consensus on what driver education/training is expected to do, so that in the future realistic evaluations are conducted and misconceptions and inappropriate expectation minimized.(p14-15)

Training and education may provide or improve knowledge and skills, but the 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 possessed, but much to do with motivation and thrill seeking (McKnight & Resnick, 1993). For example, in a study of crashes involving Victorian drivers aged 18-25 years, Catchpole et al (1994) concluded in their executive summary that:

The major categories of contributing factors were skill deficits associated with lack of driving experience; risk taking due to the influence of non-safety motivations associated with youthfulness; and exposure-related factors. The increase in accident risk due to alcohol use, especially for young drivers, is already widely accepted and needs no further confirmation.

Improving knowledge and skill does not always lead to a change in behaviour among trainees. This is true of most conventional training, including that applied to drivers. While knowledge and skill may be important, they have little direct bearing on the post-training environment or conditions under which complex behaviour such as driving will occur.

Similarly, imparting knowledge and skill is highly unlikely to undo past learning that has become firmly established through practice (and habituation), alter motivation in any lasting way, or modify underlying personal values (Christie, 1996). Most short term measures such as training, even if particularly persuasive, are unlikely to alter beliefs, values and behaviour in any durable fashion (Reardon, 1991).

It is of interest that some more recent driver training programs, despite still being in-vehicle and hands-on in nature, claim to modify “attitudes”. This is unlikely and would be unhelpful even if true, as there is a poor causal relationship between attitude and behaviour (Elliot, 1992). These training providers are perhaps reacting to criticisms of conventional driver training by claiming to address higher order skills and aspects of driving not directly related to simple car control.

6.1.3 *Driving Emergencies and Crashes are Rare Events*

Most conventional driver training tends to concentrate on skills and knowledge relevant to crash situations - what to do to avoid crashes or how to minimise the severity of an accident situation in which you may become involved. A substantial proportion of training time is often devoted to “hands-on”, “behind-the-wheel” skills. Accidents, particularly those involving death or injury, are rare events for the average driver so this knowledge or skill seldom needs to be applied, or is to a large extent forgotten when required at some time in the future.

Drivers quickly forget those behaviours which they do not have to use regularly. This is not unique, people lose competence in respect of any set of skills which are not practised or are engaged in only rarely. This applies to work skills, sporting competence or driving and is a typical characteristic of how humans learn and forget.

In a road safety context, skid-control and emergency braking/swerving are seldom required by drivers in everyday driving. Skidding and loss of control feature in less than 6% of police reported accidents and compulsory third-party insurance claims in NSW and Victoria (Andreassen, 1993; RTA, 1999) yet these continue to feature prominently in many driver training programs and courses in Australia and overseas. Under these circumstances, a driver trained in these skills is highly unlikely to retain them.

An example of this decay of training from rarely used skills can be found in research by Malaterre (1989) in France. Malaterre tested the competency of experienced drivers immediately after advanced training, with an impending collision situation. On a closed track, drivers were required to swerve, brake, or a combination of both, in order to avoid a collision. Drivers made the correct decision only about 50% of the time. This was no better than chance. Follow-up testing of those trained showed that within a matter of weeks most drivers reverted to braking-only in such circumstances. This is perhaps understandable as braking is perhaps the most automatic (and autonomic) behaviour in a crisis even for highly trained drivers. Malaterre concluded that there was little point in training ordinary drivers in advanced braking and swerving skill as they did not retain these skills given that they were not used in day-to-day driving. He also noted that braking as a first reaction may be better than attempting and failing at some other manoeuvre, as the resultant collision force would probably be less.

Traffic accidents are rare events for individual drivers. As Cairney (1986) puts it:

Since accidents and near-accidents are rare events, even the most expert drivers are likely to have limited experience of them, and certainly have not encountered enough of them in their own driving careers to have an accurate idea of the relative likelihood of different types of accident, or the types of driving behaviour which precipitate them. (p20)

The risk of casualty accidents, where someone is killed or injured, is even lower. For example, it can be calculated using NSW accident data that a driver had about a one in one million kilometres travelled chance of being involved in a casualty crash in 1997 (RTA, 1999). Based on estimated ratios calculated by Christie (1991) the involvement of drivers in property damage only accidents is likely to be about four times greater than that for casualty accidents in both NSW and Victoria. Given that the average distance travelled per annum for passenger cars (and derivatives) is about 17,000km (ABS, 1995), this suggests that a typical driver could expect to be involved in one casualty and about four property damage crashes in a 55 year driving career. As crash and annual distance travelled patterns in other parts of Australia (with the exception of the Northern Territory where risks are much higher) are generally similar, the risks per driver are likely to be much the same.

Even in the highest risk group on our roads, probationary drivers aged 18-21 years, less than 5% are involved in a casualty crash each year where someone was injured and required medical treatment (Harrison, Triggs & Pronk. 1999). Thus, more than 95% will not be involved in a casualty crash. Given that the crash risk for full licence holders is 4-5 times lower than that of probationary drivers, more than 98% of full licence holders will not be involved in a casualty crash in a typical year (RTA, 1999). Unfortunately, it is impossible to predict with certainty and precision which drivers will be in the crash-involved group.

Low individual crash risk encourages drivers to form the largely accurate view that accidents are rare and that their individual driving behaviour rarely leads to accident involvement. Most of the time, drivers can engage in illegal or risky on-road behaviour without being involved in crashes. This leads to the development of durable behavioural patterns among drivers. These are unlikely to be influenced by short-term interventions such as driver training. Overall, therefore, the low probability of crash occurrence and the decay of learning tend to work against driver training programs that concentrate on car control skills or dealing with rare events such as driving emergencies and crashes.

6.2 Alternatives To Conventional Driver Training

6.2.1 *Building Experience at Pre-Licence Level*

Road safety researchers have turned their attention to building experience among learner drivers as an alternative to training at the pre-licence and early post-licence level. As noted above, novice driver crash involvement is due mainly to a mix of inexperience and age (youthfulness), with experience being the more important contributor (Maycock et al, 1991; Catchpole et al, 1994). Some action can be taken regarding age, such as raising the minimum licence age or encouraging later licensing (eg Maycock et al, 1991 found that delaying licensing from age 17 to 18 years was associated with a decrease in crash risk of about 6% for UK drivers). However, much more can be done to increase experience among novice drivers.

In 1993 the Swedish road authorities lowered the age limit for practising as a learner to age 16. This was accompanied by a program to encourage learners to gain extensive amounts of supervised, on-road experience. Supervised experience at the learner level was viewed as potentially effective in reducing post-licence crash risk by building an “experience bank” of driving experiences not usually encountered until driving solo. In addition, supervised experience exposes the learner to a lower level of risk than that in the first year of solo driving – about 20 times lower based on recent UK research (Forsyth, Maycock & Sexton, 1995). It was also viewed as a more economical and effective alternative to additional driver training and, can operate cooperatively with commercial driving instruction (Gregersen, 1994; Gregersen & Bjurulf, 1996; Brown, 1997).

In a crash-based evaluation of this initiative, Gregersen (1997) reported a marked and statistically significant reduction - up to about 35% per kilometres travelled - in post-licence crashes for novices who gained 250% to 300% greater levels of supervised experience during the learner period (about 118 hours) relative to those who received a more typical amount (41-47 hours). Most supervised experience was provided by parents, family and friends rather than via paid-instruction. It was of some concern, however, that the amount of supervision varied along socio-economic lines with learners from more affluent families generally receiving more supervised experience (Gregersen & Bjurulf, 1996).

The success of the Swedish experience has encouraged road authorities in the UK, Australia and North America to encourage or require higher levels of supervised, driving experience prior to solo licensing. For example, learner drivers in Victoria are encouraged to accumulate 120 hours of supervised experience prior to probationary (solo) licensing under an initiative called “*Getting there from Ls to Ps*” – this program has been operating since June 1998 and is supported by educational and guidance materials for learners and their parents (Cavallo & Harrison, 1998). The Transport Accident Commission (TAC) also supports the encouragement and accumulation of supervised experience among learner drivers (Cockfield & Healy, 1999) as do leading automobile organizations such as RACV and NRMA. No evaluation of the effects of the increased experience program on Australian novice driver crashes is currently available.

6.2.2 *Graduated Licensing Systems (GLS) for Novice Drivers*

Graduated Licensing schemes or systems (GLS or GDLS) have gained popularity in New Zealand, Australia and North America over the past 15 years (Mayhew & Simpson, 1996; Baldock, 2000; Waller, Olpe & Shope, 2000). Under a GLS novice drivers do not receive an unrestricted solo driver licence immediately and must gain experience under lower risk conditions and remain relatively offence free over a period of up to three years. In essence, GLS aims to reduce the crash rates of novice drivers by accumulation of experience under a system that places some key restrictions on where, when, and how they drive (eg zero blood alcohol content (BAC), tougher demerit point cut-offs for licence suspension and perhaps restrictions on maximum speed limits, night driving, and the number of passengers carried).

Some programs, such as the Michigan program in the USA and the NSW GLS require accumulation of a minimum number of supervised hours before application for an initial solo licence - (50 hours in Michigan, including 10 hours at night – Waller et al, 2000; 50 hours in NSW - RTA, 2000) with this being recorded and certified in a logbook presented at licence testing. It is of interest that in a recent study of the Michigan GLS, the average number of supervised hours accumulated was 75 and that parents supported the program strongly –

about 97% of respondents rated that the GLS program as “good” or “very good” (Waller et al, 2000).

The crash reduction effects of Graduated Licensing programs have been evaluated in New Zealand and North America with results showing statistically significant reductions in novice driver crashes typically ranging from about 7% to over 20% - some, such as the Ontario program have reported reductions of up to 55% (Mayhew & Simpson, 1996; Baldock, 2000). Preliminary evaluation of the South Australian GLS program suggest that it has contributed to statistically significant reductions in fatality and serious injury rates among 16-19 year old drivers (O’Connor & Giles, 2000). It should be noted, however, that not all GLS programs are the same. They vary in content and duration and apply across jurisdictions with minimum solo licensing ages ranging from 15 to 18 years (Baldock, 2000).

Due to its positive effects on crash rates, there is considerable interest in introducing and/or extending Graduated Licensing systems in Australia, New Zealand and North America. Sweden is also contemplating the introduction of a graduated scheme (Vagverket, 2000). It is of note that Williams & Mayhew (1999) in mapping out a “blueprint” for graduated licensing did not see a particular place for post-basic driver training within a GLS, arguing that it is supervised experience and control of exposure-to-risk that contributes to crash reduction.

6.2.3 Higher Order Testing within GLS

Within some Graduated Licensing schemes there is a requirement to pass additional tests of higher-order skills to progress to less restricted licensing and “graduate” to full licence status. For example, the NSW GLS requires novices to pass a Hazard Perception Test (HPT) to move from the most restricted P1 licence (the first solo licence) to the less restricted P2 licence (RTA, 2000). This is a touch-screen computer test that measures the candidate’s ability to recognise and respond to potentially dangerous situations and to react appropriately. Those who do not demonstrate these skills to the required level remain on the more restricted licence until they do. A more demanding screen-based test must be passed to “graduate” from P2 level to a full NSW licence. Drivers also have to meet other requirements such as not exceeding a set number of demerit points for traffic offences. It is of interest that the Victorian HPT – used as part of initial probationary licence testing - has been shown to predict which novice drivers are likely to be involved in casualty crashes (Congdon, 1999).

Research has shown that hazard perception skills are important for novice drivers and assist in reducing crash risk (McKenna, & Crick, 1992; Catchpole et al, 1994). Requiring higher order testing with graduated schemes encourages and motivates novices to develop these skills (Lynam, 1995; Christie, 1996). Research suggests that hazard perception skills are best developed and assessed once novice drivers have had some on-road experience as solo drivers - when they have mastered basic car control skills and have sufficient spare mental capacity to attend to higher-order skills (Catchpole et al, 1994; Lynam, 1995; Gregersen & Bjurulf; West & Hall, 1998).

Recent research in Quebec (Canada) has also shown that performance on theory (knowledge) tests at initial licensing is predictive of subsequent crash involvement among new solo drivers – ie those who pass all parts first time have significantly lower crash rates in the first three years of solo driving (Maag, Laberge-Nadeau, Desjardins, Morin & Messier, 2001). It has been suggested that such initial test performance could be used as a low-cost means of “flagging” novice drivers likely to be at higher crash risk (Hirsch & Maag, 2001).

6.2.4 *A Different Type of Training*

Henderson (1991) recommends that it may be worth investigating approaches to driver training which integrate skills training with other road safety measures of an educational/promotional nature. Similarly, Lourens (1993) and Twisk (1994) note that the cost-effectiveness of driver training/education is yet to be proven and that traditional driver education appears to contribute little to traffic safety through the reduction in accident risk/involvement of trainees. However, Lourens also notes that little is known about the desirable content of cost-effective driver training/education programs or the training techniques which may make such training effective in reducing accident risk or involvement. Twisk (1994) suggests that 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 attitude and motivation shape driver behaviour. Longer-term education as opposed to training to foster development of safe attitudinal /motivational factors, using driver testing as motivator, has also been suggested (Brown, 1997). While theoretically sound, discussion earlier in this report showed that there is as yet no evidence to suggest that programs addressing these factors lead to changes in attitude, behaviour or crash risk.

Some driver training and education organisations in North America are attempting to revise existing driver training programs and high school driver education curricula to improve their potential influence on the behaviour and crash risk of drivers, particularly novice drivers (Dan Mayhew, Traffic Injury Research Foundation, personal communication, May 2001). While some revised programs may be pilot tested soon in the USA (eg the American Automobile Association's classroom and DVD-based "Licensed to Learn" program which targets novice driver problems derived from analysis of over 2,000 young driver crashes), no evaluations regarding the effectiveness of revised approaches to driver training or education are available at present (personal communication, Dr Jim McKnight, USA, June 2001).

There is also a view that the provision of traffic safety education in primary and secondary schools, integrated into the existing curriculum, may assist in the development of attitudes, values and behaviours that leads to the formation of safer and more responsible driving behaviours among adolescents (Henderson, 1991; Fresta, Lee, Leven, Mark, McAlpine, Watson & Watson, 1995). This theory lies behind the development and promotion of road safety oriented curriculum materials for kindergartens, primary schools and secondary colleges by road authorities, motoring organisations and education departments in jurisdictions such as Queensland, NSW and Victoria. While this approach has theoretical and educational merit, there is as yet little scientific evidence to suggest that it does contribute to lower crash risk among novice drivers (Harrison, Penman & Penella, 1997). This is due, in part, to the difficulty in controlling for variables such as maturation, experience, exposure-to-risk and the influence of other road safety initiatives operating in the community (Harrison et al, 1997).

6.2.5 *Fleet Management to Enhance Crash Reductions*

As noted above, fleet safety programs such as that effectively evaluated within Swedish Telecom show that a combination of approaches can help reduce crash risk and involvement within company fleets (VTI, 1990). This point was noted by Christie (1991) who suggested a multifaceted approach to fleet safety dealing with the selection of personnel and vehicles and management of where, when and how vehicles are used. The Monash University Accident

7.0 CONCLUSIONS

The research evidence suggests that driver training of a traditional and conventional nature contributes little to reductions in accident involvement or 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 to novice drivers, they have little influence on the driving environment or conditions under which driving behaviour occurs post training. Conventional driver training is also unlikely to undo firmly established past learning laid down over weeks, months and years of practice and experience, nor durably alter motivation or modify underlying personal values.

It is of concern that the provision of conventional driver training beyond that required to gain an initial driver licence, often leads to increased accident risk among novice drivers. Research suggests that this is due to encouragement of earlier licensing, increased exposure-to-risk and/or unduly increasing the confidence of novices about their driving abilities.

A better alternative for novice drivers is to address the experience (or rather the lack of it) factor which has been shown to contribute to first year drivers having an elevated casualty accident risk. This approach has been taken up by most Australian driver licensing jurisdictions and some in North America via the implementation of Graduated Licensing schemes which provide for and encourage learner drivers to build their stocks of supervised, on-road driving experience before solo driving. Swedish research suggests that it contributes to post-licence reductions in casualty crashes of up to 35%.

Resources committed to post-basic driver education/training may actually act to undermine effective road safety programs by diverting scarce funds and community attention away from more effective initiatives likely to reduce crash risk. However, there is 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 an adjunct to other accident reduction measures.

New approaches to driver training may eventually prove to be useful in reducing casualty accident risk/involvement, but much research and development work remains to be done before one could say that driver training is an effective crash countermeasure. In the interim, other approaches such as increased supervision and graduated licensing for novice drivers and traffic law enforcement for all drivers are likely to make greater and more lasting contributions to road safety.

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