

The effectiveness of driver training as a road safety measure: An international review of the literature

Christie, R., RCSC Services Pty Ltd

Abstract

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. 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. This paper summarises an extensive review of the international literature on the effectiveness of driver training programs for learner drivers, young/recently licensed drivers and experienced drivers produced for the RACV Public Policy Group in mid 2001. Overall, the paper concludes that driver training could not be considered an effective crash countermeasure. 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.

Keywords

Driver, Training, Education, Young.

Introduction

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 involvement¹. Calls for increased or compulsory driver training are often heard particularly when the road toll appears to be rising in a particular jurisdiction. This paper summarises an extensive review of the international literature on the effectiveness of driver training programs for learner drivers, young/recently licensed drivers and experienced drivers produced for RACV in mid 2001 – see Christie (2). 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. Evaluations and reviews published in scientific journals, conference proceedings or by reputable sources such as government agencies, universities, and research organisations published in Australia, New Zealand, North America, United Kingdom and Europe over the last three decades were examined.

Driver training and driver education are not the same – the former is a sub-set of the latter^{3,4}. However, given it has become common even in the scientific literature for these terms to be used synonymously there was a need to review published materials labelled as both “driver education” and “driver training” in the course of compiling the review⁵. The types of driver training reviewed included that provided at pre-licence and post-licence levels, including that described as, defensive (ie purporting to help drivers avoid getting into critical situations), advanced (ie purporting to assist drivers cope with critical situations that may arise) and driver improvement (ie that which targets accident/violation-involved drivers with a view to reducing recidivism and reducing crashes).^{2,3}

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 schemes within driver licensing programs.^{6,7}

Basic driver training works at an instructional level in that most people who are initially trained to drive by a driving school, friends, relatives or a combination thereof achieve licensed driver status.⁸ 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.^{3,8}

It is of note that the post-licence crash experience of those trained via professional instructors and those trained by parents, relatives or friends tend to be much the same.⁹ UK research suggests that novices who received only professional instruction were less likely to pass initial driving tests and may have higher post-licence crash rates.¹⁰ The level and variety of traffic experience is generally lower in professional instruction relative to that received by learners when supervised by friends or relatives¹⁰. 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%).¹¹ 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.^{11,12}

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.^{13, 14, 15} There is also considerable evidence that driver training that attempts to impart advanced skills such as skid control may contribute to increased crash risk, particularly among young males.^{16, 17} In addition, mandatory pre-licence training or even formal pre-licence training/education, such as US high school Driver Education, provided through secondary schools, may contribute to increased exposure-to-risk for young drivers, particularly females, by encouraging early solo licensing.^{18, 19, 20} This pattern of results has been confirmed across numerous studies conducted in Australia, New Zealand, North America, Europe and Scandinavia over the last 20 years - including US and Australian research published only last year.^{21, 22, 23, 24, 25, 26}

Off-Road or On-Road Training for Novice 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.^{27, 28} Evaluations have generally found no significant differences between novices trained off-road and those trained on-road in respect of subsequent crash or violation involvement.^{15, 21} Off-road training is more expensive to provide than on-road training as off-road facilities are costly to build, operate and maintain.^{21, 29, 30} Such facilities may also divert scarce funds away from more worthwhile 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.^{13, 17} Learner drivers under supervision on-road have a low risk of crash involvement, probably the lowest of all driver groups.³¹ The accumulation of an on-road “experience bank” is perhaps the major potential contributor to reduced crash risk in solo driving for novice drivers.^{13, 17}

The Effectiveness of Driver Training for Young and/or Recently Licensed Drivers

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.³² 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.^{33, 34, 35} Some better-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).³⁶

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.³⁷ Again, such training often leads to an increase in confidence and sometimes and increase in crash risk for novices, particularly young males.^{9, 14} 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.¹⁴ Several programs using this better-based approach – sometimes referred to as “Insight” training - have been trialed in Sweden and the Netherlands.^{36, 38} 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. Preliminary evaluation of a recent Finnish program for novices – it targets risk avoidance and speed control six to 24 months after initial licensing - suggests that it may have contributed to a significant reduction in crashes, particularly among males, but had less impact on females.³⁹ While novice drivers under this 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, the authors concluded that the new approach contributed to statistically significant reductions in crashes among novice drivers.³⁹

Training for novices, beyond basic-pre licence training, is generally 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 at present.

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.^{3, 6, 7} This is unremarkable as experienced drivers (particularly those aged 25-59 years) already have a relatively low crash risk per distance travelled.³² 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.^{40,41}

Some driver training providers claim that their programs produce accident reductions, particularly in fleet settings. Many of these claims are often based on small samples, testimonials or data derived by non-scientific means.³ 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 and Australian 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.^{42,43}

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 although persistent in the community are often false and based on beliefs not supported by the weight of research evidence.^{1,3,37}

It may be unreasonable to expect an educational or instructional tool such as driver training to deliver crash reductions as improving knowledge and skill does not always lead to a change in behaviour among trainees.^{3,5} 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 less to do with how much skill and/or knowledge they possess, but more to do with motivation and higher-order factors.^{44,45} Driver training is 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.^{1,3}

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.³ 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 only rarely applied.

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.¹¹ VicRoads, TAC and other road safety organisations are encouraging this approach in Victoria.
- ?? **Graduated Licensing Systems (GLS) for Novice drivers:** Under a GLS novices 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. Evaluations of GLS programs in New Zealand and North America show significant reductions in novice driver crashes ranging from 7% to over 55%.⁴⁶ 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.⁴⁷
- ?? **Higher Order Testing within GLS:** Some GLS programs require novices to pass additional tests of higher-order skills to progress to less restricted licensing levels and to “graduate” to full licence status. For example, the NSW 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 suggests that such tests can predict novice drivers likely to be at greater crash risk.⁴⁸

- ?? **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.¹⁴ This may include experimenting with variants of the Swedish “Insight” type training noted above. Longer-term education to foster development of safe attitudinal/motivational factors, using driver testing as a motivator, has also been suggested as an alternative to short-term training.¹⁰ While theoretically sound, there is as yet no evidence to suggest 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 and vehicles 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, integrated training/education, incentives for crash free driving (not reward) and overall occupational health and safety policy within organisations.⁴³ This represents a potentially more effective approach than relying on conventional driver training.
- ?? **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.⁴⁶ Targeted deterrence and enforcement measures have a greater probability of changing driver behavior than traditional driver training programs ostensibly aimed at reducing accident risk⁴⁹

Conclusions

Overall, the research evidence suggests that driver training of a conventional nature contributes little to reductions in accident involvement or risk among drivers of all ages 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.

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, 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 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 lack of experience 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 (GLS) 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%. 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 may also 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.

At present, one could not say that driver training is an effective crash countermeasure. 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.

Acknowledgements

This paper is based on an extensive review produced for the Public Policy Group of RACV Ltd.

References

1. Watson, B. (1997). When common sense just won't do: misconceptions about changing the behaviour of road users. In Bullen & Troutbeck (Eds). *The Second International Conference on Accident Investigation, Reconstruction, Interpretation & the Law: Proceedings*, 20-23 October 1997 (pp347-359): Brisbane.
2. Christie, R. (2001). The Effectiveness of Driver Training as a Road Safety Measure: A Review of the Literature. Report prepared for RACV Ltd: Noble Park, Victoria.
3. Christie, R. (1996). Driver training - What have we learned? *NRMA Today*, Edition 12, 20-24.
4. Horneman, C. (1993) Driver education and training: A review of the literature. Research Note RN 6/93. Rosebery, NSW: Roads and Traffic Authority (NSW) Road Safety Bureau.
5. Palmer, J.W. (1995). Prospects for improving driver training in the United States. In H.S. Simpson (Ed) (1996). *New to the Road: Reducing the Risks for Young Motorists. Proceedings of the First Annual International Conference of the Youth Enhancement Service, June 8-11 1995*. (pp 115-120). University of California: Los Angeles.
6. Saffron, D.G. (1981). *Driver and rider education, training and licensing: A brief review*. Report No. 4/81. Rosebery: Traffic Accident Research Unit, New South Wales.
7. Watson,B., Fresta,J., Whan. H., McDonald, J., Dray, R., Beuermann, C., & Churchward, R. (1996). *Enhancing driver management in Queensland*. Brisbane: Land transport & Safety Division, Queensland Transport.
8. McKnight, A.J (1992) Driver licensing in Victoria. Report No. 27. Clayton, Victoria: Monash University Accident Research Centre,
9. Lynam, D. and Twisk, D. (1995). *Car Driver Training and Licensing Systems in Europe* - Report prepared by members of Forum of European Road Research Institutes (FERSI) and supported by European Commission Transport Directorate (DG VII), Report No. 147. Crowthorne (UK): Transport Research Laboratory (TRL).
10. Brown, I.D. (1997). How traffic and transport systems can benefit from psychology. In T. Rothengatter & E. Carbonell Vaya (Eds). *Traffic and Transport Psychology: Theory and Application* (pp 9-20). Amsterdam: Pergamon.
11. Gregersen, N.P. (1997). Evaluation of 16-years age limit for Driver training. First report *No. 418A. Linköping, Sweden: VTI (Swedish National Road & Transport Research Institute)*.
12. Gregersen, N.P. (1994). Systematic co-operation between driving schools and parents in driver education. *Accident Analysis & Prevention*, 26(4), 453-461.
13. Mayhew, D. R. & Simpson, H.M. (1995). *The Role of Driving Experience: Implications for the Training and Licensing of New Drivers*. Insurance Bureau of Canada: Toronto.
14. Mayhew, D. R. & Simpson, H.M. (1996). The Effectiveness and *Role of Driver Education and training in a Graduated Licensing System*. Ottawa, Ontario: Traffic Injury Research Foundation.
15. Mayhew, D.R. Simpson, H.M., Williams, A.F. & Ferguson, S.A. (1996). Effectiveness and Role of Driver Education & Training in a Graduated Licensing System,. *Journal of Public Health Policy*, 19(1), 51-67.
16. Glad, A. (1988). Phase 2 Driver education, Effect on accident risk. , Oslo, Norway: Transport Institute.
17. Gregersen, N.P. (1996). Young drivers' overestimation of their own skill: An experiment on the relation between training strategy and skill. *Accident Analysis & Prevention*, 28(2), 243-250.
18. Potvin, L. (1991). The Evaluation of a compulsory driver training policy: Quebec 1980-1984. In Proceedings - New to the Road Symposium: Prevention Measures for Young or New Drivers, Halifax, Nova Scotia, Canada.
19. Levy, D.T. (1990). Youth and traffic safety: The effects of driving age, experience and education. *Accident Analysis and Prevention*, 22(4), 327-334.
20. Dussault, C. (1998). The Quebec Graduated Licensing System for new drivers: Background and preliminary results. In *Proceedings, 1998 Road safety Research, Policing and Education Conference*, (Vol 1, pp57-66) November. Wellington, New Zealand.
21. Strang, P.M., Deutsch, K.B., James R.S., and Manders S.M., (1982). A comparison of on-road and off-road driver training. Report No. 1/82 SR. Hawthorn, Victoria: Road Safety & Traffic Authority.
22. Stock, J.R., Weaver, I.K., Ray, H.W., Brink, T.R. and Sadof, M.G. (1983). *Evaluation of safe performance, secondary school driver education curriculum demonstration project. Final Report*. Springfield, VA, USA: National Technical Information Services.
23. Wynne-Jones, J.D. & Hurst, P. (1985). *The AA Driver Training Evaluation*. Traffic Research Report No. 33. Wellington, New Zealand: NZ Ministry of Transport.
24. Langford (1999). Does Pre-Driver Training Work? Yes, No, Maybe! In Proceedings, 1999 Road Safety Research, Policing and Education Conference, (Vol 2,pp645-653). November, University House, Canberra,
25. Haworth, N., Kowaldo, N. & Tingvall, C. (2000). *Evaluation of pre-driver education program*. Report No. 167. Clayton, Victoria: Monash University Accident Research Centre.

26. McKenna, C.K., Yost, B., Muzenrider, R.F & Young, M.L. (2000). *Program evaluation of Pennsylvania's Driver Education Program*. Harrisburg, PA: Pennsylvania Department of Transportation.
27. Roads & Traffic Authority (RTA) (1996). Defensive and advanced driver training. In Proceedings of *Drivers as Workers, Vehicles as Workplaces: Issues in Fleet Management* seminar, Staysafe Report No 9/51, Parliament of NSW Joint Standing Committee on Road Safety: Sydney. 129-135.
28. Christie, R. (2000). Off-road facilities for traffic safety education and novice driver training- A cautionary tale. In Proceedings of the Saferoads, Local Government Road Safety Conference, Melbourne, Australia, 20-21 July.
29. Council, F.M., Roper, R.B. & Sadof, M.G. (1975). *An evaluation of North Carolina's multi-range program in driver education: A comparison of driving histories of range and non-range students.* Chapel Hill, NC: University of North Carolina Highway Safety Research Center.
30. Dreyer, D. & Janke, M. (1979). The effects of range versus non-range driver training on the accident and conviction frequencies of young drivers. *Accident Analysis & Prevention*, 11(3), 179-198.
31. VicRoads (1998). *Getting there from Ls to Ps: A Step-by-Step Guide for Learners and Supervising Drivers* Author: Kew.
32. VicRoads. (2000) *Road Safety Strategy for Victoria 2000-2005 Discussion Paper*. Kew: Author.
33. Holubowycz, O.T., and McLean, A.J. (1980). Evaluation of a road safety program for automotive apprentices. Adelaide, SA: Road Accident Research Unit, University of Adelaide.
34. Payne, S., Brownlea, & Hall, A. (1984). Evaluation of Queensland defensive driving course. Report No. CR 27. Canberra: Federal Office of Road Safety.
35. Watson, B. (1994). *Driver education and training: An overview of the evidence and the implications for young drivers*. Brisbane. Queensland Transport.
36. Gregersen, N.P. (1995). What should be taught? Basic vehicle control skills or higher order skills? In H.S. Simpson (Ed) (1996). *New to the Road: Reducing the Risks for Young Motorists. Proceedings of the First Annual International Conference of the Youth Enhancement Service, June 8-11 1995.* (pp103-114.) University of California: Los Angeles.
37. Woolley, J. (2000). *In-car driver Training at High schools: A Literature Review*. Report No. 6/2000. Adelaide: Transport SA:
38. Siegrist, S (Ed) (1999). *Driver Training, Testing & Licensing – towards theory-based management of young drivers' injury risk in road traffic*. Results of EU Project GADGET, Work Package 3. Berne: Schweizerische Beratungsstelle für Unfallverhütung (BFU).
39. Keskinen, E., Hatakka, M., Katila, A., Laapotti, S., & Peraaho, M. (1999). Driver training in Finland. *IATSS Research*, 23(1), 78-84.
40. Brown, I.D., Grueger J.A. and Biehl, B. (1987). Is driver training contributing enough to road safety? In Rothengatter, J.A. and de Bruin, R.A. (Eds). *Road Users and Traffic Safety*, Assen/Maastricht, The Netherlands: Van Gorcum.
41. Struckman-Johnson, D.L. Lund, A.K. Williams, A.F. and Osborne, D.W. (1989). Comparative effects of driver improvement programs on crashes and violations. *Accident Analysis and Prevention*, 21(3), 203-215.
42. VTI - Swedish Road and Traffic Research Institute (1990). Traffic safety in the Telecommunications Administration, in VTI Annual Report 1989/90. Linköping, Sweden: Author.
43. Haworth, N., Tingvall, C. & Kowald, N. (2000a). *Review of best practice road safety initiatives in the corporate and/or business environment*. Report No. 166. Clayton, Victoria.: Monash University Accident Research Centre.
44. McKnight, A.J & Resnick, J. (1993). Youthful driver at risk workshop: Background issue paper. In K. Young (Ed). (1993). *Workshop to Identify Training Requirements Designed to Reduce Young Driver Risk Taking and improve Decision Making Skills*. Report No. DOT HS 808 066. Washington, DC: US Dept of Transportation, National Highway Traffic safety Administration.
45. Catchpole, J., Cairney, P. & Macdonald, W. (1994). *Why are young drivers over-represented in traffic accidents?* Special Report No. 50. Vermont South, Victoria.: Australian Road Research Board.
46. Baldock, M. (2000). A literature review for Graduated Driver Licensing. In T. Bailey (Ed). *Graduated Driver Licensing in South Australia*. Report No. 1/2000. Adelaide: Transport SA.
47. O'Connor, P. & Giles, L. (2000). Evaluation of the SA Graduated Driver Licensing Scheme. In T. Bailey (Ed). *Graduated Driver Licensing in South Australia*. Report No. 1/2000. Adelaide: Transport SA.
48. Congdon, P. (1999). VicRoads Hazard perception test, can it predict accidents? Camberwell, Victoria: Australian Council for Educational Research (ACER).
49. Williams, A.F., Paek, N.N., & Lund, A.K. (1995). Factors that drivers say motivate safe driving practices. *Journal of Safety Research*, Vol 26(2), 119-124.