THE STATUS OF HAZARD PERCEPTION TESTING IN AUSTRALASIA

Prepared by: Peter Palamara, Injury Research Centre, School of Population Health, The University of Western Australia and Claire Adams, formerly from Injury Research Centre, School of Population Health, The University of Western Australia

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1. A BRIEF STATEMENT OF THE ISSUE

The perception skills of drivers, in particular those skills related to the detection of, and response to, hazardous situations, have been identified as contributing factors to the over-representation of young novice drivers in road crashes.[1,2] In recognition of this, jurisdictions in Australia and elsewhere have developed and implemented computerised assessments of the hazard perception abilities of learner drivers for at least two purposes:

- to identify those with adequate, 'safe' hazard perception skills who would thus be allowed to progress further through the licensing system
- to use the presence of testing to encourage the development of hazard perception skills during the learning periods through increased driving practice and other means.

2. AN ASSESSMENT OF THE ROAD SAFETY ISSUE

It is widely recognized across all highly motorized Western countries that young motor vehicle drivers, relative to older and more experienced drivers, have a much higher risk of involvement in crashes that result in either death or hospitalisation. Australia-wide, the population fatality rate for drivers aged 17-25 years is approximately double that of drivers aged 40-59 years: 8.6/100,000 population versus 3.8/100,000[3]. In general, the risk of being involved in a police recorded crash is highest in the earliest period of licensure and declines with increasing experience. For example, 17 year old drivers are 4.1 times more likely to crash in the first month of licensure compared with the 60th month of licensure[4].

Precisely why young and novice drivers are over-represented in road crashes has been the subject of considerable research and debate. Commonly accepted reasons include a propensity for risk-taking plus a lack of driving experience and associated skills. While very few crashes among drivers of all ages result from deficits in psychomotor skills *per se*, there is evidence that attentional, perceptual and information-processing errors are important contributing factors to their crash involvement (MacDonald, 1994, cited in[5]). This is particularly relevant to young novice drivers who display poorer skills compared with older, more experienced drivers in regard to the awareness, identification and time to detection of, potentially hazardous situations and objects on the road[2]. Consistent with this, deficits among young, inexperienced drivers in higher-order perceptual skills related to hazard perception have been found to correlate with crash involvement[1,6].

Hazard perception is not a unitary skill but one that involves a number of processes, including (i) the detection of a potential hazard and (ii) an appraisal of the hazard as a threat and requiring a response. Once the hazard is perceived, the driver has to (iii) select an appropriate response and (iv) implement the selected response[7]. Hazard perception involves good scanning ability and anticipation, and consistently good hazard perception skills take about two years to develop[8,9].

The skills required for hazard perception are thought to develop with driving experience and exposure to a diverse range of driving situations and scenarios[10]. With experience, drivers develop rules and hypotheses for driving, including the detection of hazards, which are subsequently represented as cognitive 'schemata'. The function of these schemata, which are thought to be more highly developed among experienced drivers, is to guide and influence future appraisals and responses to the various driving scenarios encountered[11].

There is other evidence to show that, apart from on-road experience, the hazard perception skills of inexperienced drivers can be improved through moderate amounts of laboratory-based computer training[1]. Whether the improvement in these laboratory-based skills can be readily and consistently translated into reduced crash involvement is yet to be established[7,12,13].

As hazard perception abilities may be an important contributor to the crash involvement of young drivers, it has been proposed that screening learner drivers for poor hazard perception skills may be an effective means of lowering their risk of crashing[2]. To date, only three countries – Australia, New Zealand and the United Kingdom – and the Canadian province of British Columbia have introduced hazard perception skills testing as part of their driver training and licensing requirements.

3. CURRENT POLICIES AND PRACTICES IN AUSTRALASIA

Across Australia, three jurisdictions currently assess the hazard perception skills of learner or newly licensed drivers (see Table 1). Two other Australian jurisdictions – Queensland and South Australia – have publicly indicated an interest in adopting hazard perception testing as part of their revised driver training and licensing requirements[14].

Table 1: Hazard perception testing in Australasia, August 2005

State	Hazard Perception Testing	Type	Stage of licensing
Victoria	Yes	Computer	At the end of the L period of supervised practice, prior to gaining a probationary licence.
New South Wales	Yes	Computer	At the end of the P1 licence stage (12 months solo driving experience) before progressing to the P2 licence and again at the end of the P2 stage.
Western Australia	Yes	Computer	At the end of the 'L' period of supervised practice, prior to gaining a provisional licence.
Queensland	Under review		At the end of the P1 licence stage (12 months driving experience) before progressing to the P2 licence.
South Australia	Under review		A graduated licensing scheme recommended by the Road Safety Advisory Council suggests a HPT between P1 and P2 licensing stages.
Northern Territory	No		
Australian Capital Territory	No		
Tasmania	No		
New Zealand	Yes	In car on-road test	At the end of the provisional driving period, to graduate to a full licence.

3.1 Victoria

In 1996, Victoria was the first Australian jurisdiction to introduce hazard perception skill testing as part of local licensing conditions[6]. Learner drivers (i.e., those allowed to drive only under supervision) complete the Hazard Perception Test (HPT), along with a knowledge and practical driving assessment, at a minimum age of 18 and usually after a minimum of six months learning practice, before entering a three-year probationary licence period.

According to Congdon[6] (page i), the initial aims of the HPT were to:

- screen novice drivers at the probationary licence test stage for their ability to assess traffic situations and to make safe driving decisions. Together with the practical drive test, it provides a more complete assessment of important driving capabilities required to meet the demands of licensed driving
- encourage novice drivers to obtain more on-road, supervised driving experience and instruction prior to licensing as a means to develop hazard perception skills.

The first version of VicRoads' HPT was found to have low reliability due to the limited number of test items[6]. The test has been recently updated and expanded and now comprises 28 randomly-selected traffic scenes, with the current version taking approximately 30 minutes to complete.

3.2 Western Australia

In Western Australia, the minimum learner-driver age is 16 years and the minimum provisional licensing age is 17 years. Learner-drivers are required to complete an on-road assessment of their driving skills (known as the Practical Driving Assessment which may completed at a minimum age of 16 years and 6 months) before entering the second phase of their learner permit in which they must complete a mandatory 25 hours of supervised experience. Upon completion of their supervised practice and having reached 17 years of age, learner-drivers are then required to successfully complete a test of their hazard perception skills to enter a two-year provisional licensing period.

Hazard perception skill testing has been a requirement since February 2002 and is assessed using the updated version of the VicRoads HPT. At present, learner-drivers in the more remote areas of Western Australia do not complete a HPT because of a lack of infrastructure to support the test in these areas.

3.3 New South Wales

The minimum learner-driver age in NSW is 16 years and, as in Victoria and Western Australia, all driving during this time must be supervised. Learners may move to a provisional phase one licence (P1) of unsupervised driving at 17 years of age, once they have completed 50 hours of supervised driving and passed the Driving Ability Road Test. The P1 licence must be held for a minimum of 12 months before the driver can attempt to graduate to a provisional phase 2 licence (P2) which must be held for a minimum of two years.

NSW introduced a locally-developed HPT in 2000. The current licensing program requires provisional drivers to complete the test on two occasions. The first HPT is undertaken when the driver has completed a minimum of 12 months in P1 and has been driving unsupervised, with speed and other restrictions. This is a simple test, similar to the VicRoads test, with one hazard at a time being presented over 15 test items. The second test, called the Driver Qualification Test, is an exit test from the P2 period before graduating to a full licence. The test assesses both knowledge of road rules and safe driving and advanced hazard perception skills, in which up to six or seven hazards may be presented in any one scene.

3.4 Overview of the Australian Hazard Perception Test format and process

Hazard perception testing in each of the three Australian jurisdictions occurs via a computer-based presentation of a series of filmed driving scenes. For each scenario (test item), the candidate is required to complete a prescribed driving manoeuvre (e.g. turn right when safe to do so), for which the correct response is indicated by either an active response (i.e. clicking the mouse button or touching an interactive computer screen) within the correct window response time, or a passive response (i.e. no mouse click or touch) to indicate that it was not safe to undertake the manoeuvre (Russell Scott, VicRoads, personal communication). In general, test items are based on the most commonly occurring crash scenarios for young novice drivers[12].

There are, however, some differences in the timing of the HPT across the three jurisdictions. In Victoria and WA, the test must be passed before the learner can graduate to a probationary phase of unsupervised driving. In NSW, the HPT is used to show proficiency to graduate from the restricted P1 licence to the less restrictive P2 licence after 12 months of unsupervised driving.

The argument for the HPT at the end of the learner phase, before any solo driving, is that new drivers are most at risk of crashing in the initial months of licensure, so screening for hazard perception skill deficits at this time ensures the driver reaches a certain standard of hazard awareness and safety prior to solo driving. It has also been suggested that the placement of the HPT as an entry, rather than an exit, test is both politically and economically more acceptable[5].

The argument for undertaking the HPT after a period of solo driving is to allow the new driver the opportunity to develop automatic mastery of in-car driving skills[16]. Introducing the HPT before automation is achieved in the mechanics of driving is considered counterproductive because the new driver simply does not have the cognitive capacity to cope at that stage. For example, research has found that young drivers' awareness, identification, and time to detection of potentially hazardous situations and objects on the road are far slower during complex situations that have a high cognitive demand[2,17].

Due to the relative newness of the various HPT programs and the absence of comparative studies, it is unknown whether the timing or placement of the HPT affects the crash rate for new drivers.

3.5 New Zealand

In New Zealand, hazard perception testing is incorporated in the final practical driving test that novice drivers take when graduating from a restricted licence (provisional) to a full licence (Michael Cummins, Manager Education, LTSA, personal communication). The restricted licence is held for 18 months (unless a course is completed). The test to graduate to a full licence is a 45-minute on-road driving test which includes a significant hazard detection and response component. Candidates are required to demonstrate that they can detect and respond to driving hazards in both a built-up area and on roads with higher speed zones[15]. As the candidates are driving along, they have to describe out loud to the examiner, the hazards they are seeing and what they will have to do to deal with them.

3.6 Hazard perception testing elsewhere

To the best of the authors' knowledge, the only other country that currently undertakes computer-based hazard perception testing is the United Kingdom. This is a recent introduction, using computer-based technology similar to that employed for hazard perception testing in Australia. The test differs from the Australian format in that the scenes chosen for inclusion were based on traffic scenarios that could significantly differentiate between experienced and inexperienced drivers, in contrast to the Australian tests which use scenes based on the types of crash new drivers are most commonly involved in.

4. A REVIEW OF THE RESEARCH

To date, only one study has examined the predictive validity of an Australian standardised test of hazard perception skill using objective police-recorded crash data as the outcome[6]. In that study, the results of logistic regression analysis based on the HPT scores of drivers licensed in Victoria between April 1996 and December 1997 allowed the author to claim that "the HPT measures contribute to identifying those cases involved in some types of police reported casualty accidents … The HPT measures were evident in identifying fatal and serious injury accidents for novice drivers generally and identifying other injury accidents for 18-year-old females specifically" (p56)[6]. These positive results notwithstanding, it was considered that the precision of prediction needed to be improved at the individual-driver level, with the variable and inconsistent nature of the relationship between HPT scores and casualty crash involvement attributable in part, to the low psychometric reliability of the test.

Recommendations were subsequently made to improve the reliability of the test[18,19]. To the best of the authors' knowledge, no information is currently available on the predictive validity of the updated version of the VicRoads test or of the test used in New South Wales.

In addition to the issue of predictive validity, there has been insufficient debate and research in Australia regarding the ecological validity of computer-based assessments of hazard perception skills. The test situation of a learner driver sitting at a computer in an office and responding to a filmed driving scenario bears little or no resemblance to the reality of the task required in the demanding and uncontrolled environment of on-road driving. The consequences of a driver's choice are markedly different across the two scenarios, which suggests that the motivations underlying the driver's decision-making are likely to vary also. It appears that no Australian studies have been conducted of the generalisability of computer-based hazard perception skills to on-road driving.

The use of the HPT in Victoria is in response to the lack of evidence that on-road testing has an impact upon the safety of drivers, once licensed. The Victorian safety authority has subsequently argued that a new response which encourages applicants to gain maximum appropriate practical experience before applying for their licences, is required. The HPT is seen as providing this encouragement.

With respect to the utility of the HPT as a population-based road safety countermeasure, there appears to be no available evidence that the introduction of hazard perception testing in either Victoria or New South Wales has contributed to a decline in young novice driver crash and injury rates. Western Australia is currently undertaking a comprehensive evaluation of its Graduated Driver Training and Licensing program that will include an analysis of the predictive validity of the HPT and an assessment of the efficacy and cost-effectiveness of the measure as a population-based road injury countermeasure. No population-based studies have been conducted in the U.K. of the impact of HPT on novice driver crash and injury rates, nor is there any evidence from New Zealand that hazard perception testing has independently and significantly contributed to a decline in young driver crash and injury rates.

At the same time, it needs to be recognized that any empirical demonstration of possible benefits is not a straightforward task and that a number of road safety countermeasures targeting young drivers – including on-road testing of safe driving - have been developed and continue to be implemented in the absence of any demonstrable crash impact. In addition, Victoria safety authorities report that at least the HPT compares well to other methods on a costs basis, is the only novice driver assessment device to produce (albeit limited) evidence of an association with crash involvement, allows for a safe and consistent testing environment and appears to have contributed to increased driving practice during the Learner period.

5. POLITICAL, SOCIAL AND OTHER FACTORS

Despite the lack of supporting empirical evidence for the predictive validity and efficacy of HPT as a road injury countermeasure, it has seemingly attained widespread acceptance in Australia as a useful component of driver training and licensing programs. This widespread commitment may be attributed in part to the following reasoning: since the research has shown that young drivers have poor hazard perception skills, the introduction of HPT as an assessment tool may have a further advantage of prompting the very development of those skills. It may be further argued that, as HPT appears to be the best available measure of hazard perception skills, it needs to be persevered with, at least until a more promising avenue appears.

However, perseverance with the development of effective hazard perception tests should not be at the expense of other proven driver licensing initiatives. For example, evaluations of the Graduated Driver Licensing programs operating in numerous countries including the USA, Canada and New Zealand, have consistently shown that young, novice driver crash involvement and injury can be demonstrably reduced as a result of these programs[20].

6. CONCLUSIONS

Currently there is no evidence to support the notion that the introduction of hazard perception skill testing anywhere in Australia has made a direct impact upon the crash and injury rates of young drivers. One jurisdiction is however arguing an ‘indirect safety benefit’ of the HPT in that Learner drivers will spend more time diving under supervision so as to prepare for the HPT.

The placement of the test in the licensing program is seen to vary, though whether this impacts on the skills and crash involvement of novice drivers is unknown. It is also reasonable to question the ecological validity of a computer-based test of hazard perception skill. The consequences of a wrong decision on a computer are vastly different to a wrong decision on the road. That said, there is an advantage to computerisation in that it allows standardisation of the test, is easy to mark, and is cost-effective to administer. Finally, hazard perception testing should not be regarded as *the* panacea for the young novice driver problem. Evidence from overseas jurisdictions suggests that a comprehensive Graduated Driver Licensing program has the capacity to effect a reduction in young novice driver crashes and injuries – with HPT having a possible role within the program, subject to demonstrable association with unsafe driving and/or crash risk.

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