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"DISABLED DRIVER TEST PROCEDURES"

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EXECUTIVE SUMMARY

The purpose of the project was to document and evaluate current Australian practice in the assessment of drivers with disabilities.

This was achieved by means of:

- * a survey of everyone trained in one of the two Australian courses for occupational therapists in driver assessment and rehabilitation
- * detailed personal interviews in each Australian state and territory with people, mostly occupational therapists, known to be active in driver assessment
- * obtaining information from the licensing authorities of each state and territory concerning their practices in relation to the assessment of drivers with disabilities
- * a review of published literature concerned with the documentation, evaluation and development of such assessment practices.

A theoretical framework was developed to provide the basis for evaluation of the construct validity of current assessment systems.

It was concluded that current Australian assessment practice provides more than adequate off-road testing of basic sensory and motor capabilities; however, off-road testing of cognitive capacities needs to be extended.

the currently recommended on-road assessment is good in its use of set routes of graduated difficulty, with a standardised observation and scoring procedure. Unfortunately, current level of compliance with the standard is not high. Compliance with recommended procedures for many off-road tests is also less than satisfactory, given that reliability is only achievable when specified procedures are followed closely.

In the case of assessment components other than the standard tests of sensory and physical capacities, there is a need for normative data to enable valid interpretation of test performance scores.

It is recommended that:

- * cost-effectiveness of the assessment system should be improved by the development and application of guidelines whereby only those subsets of tests which are warranted in a particular conditions should be given, rather than administering all tests to everyone regardless of type of disability

- * additional tests of basic cognitive capacities are needed; potentially useful tests documented in the literature need to be evaluated and developed as necessary for use by Australian assessors.
- * improved tests of cognitive components of driving performance should be developed; either an Australian version of the Driver Performance Test or a modified form of the current Victorian Hazard Perception Test should be developed and evaluated for this purpose
- * a test or procedure should be developed to provide a more objective means of obtaining information to assess the probability of drivers with disabilities adopting "compensatory" behaviour strategies at the strategic level which reduce their exposure to crash risk, and at the tactical level to reduce the "riskiness" of driving performance
- * current efforts to improve the reliability and validity of on-road testing by use of standard routes with highly specific, standardised observation and scoring procedures should be pursued further, in order to achieve a higher level of compliance and hence of test reliability
- * the reliability of off-road tests needs to be improved by clearer specification of test procedures in some cases, and by further education of assessors concerning the importance of compliance with the procedures; in facilities with a high level of driver assessment activity, the possibility of employing technical assistants to apply standard off-road procedures should be explored
- * normative data should be obtained for all tests in the assessment battery, other than those standard tests of basic sensory and physical capacities for which such data already exists
- * the relationship between off-road and on-road test performance needs to be established for all tests in the assessment battery
- * There is a need for better communication between occupational therapists, some Australian licensing authorities, doctors and other health professionals involved in the care of people with disabilities, and the wider community, concerning the needs of drivers with disabilities for special assessment; information on the nature and availability of the Australian occupational therapy driver assessment and rehabilitation system for people with disabilities needs to be disseminated more widely.

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1. INTRODUCTION

1.1 CRASH RISK AND DRIVER LICENSING

The purpose of licence testing is to determine whether drivers are able to operate their vehicles in traffic with an adequate level of competence; this is generally presumed to be necessary for the maintenance of road safety. However, lack of competence is not the only cause of road crashes.

A driver's crash risk is determined by two sets of factors: those related to the driver's *behaviour* on the road, and those determining the driver's *exposure to risk*; ("exposure" refers to the distance driven and the conditions of time, place, etc. under which driving occurs). Driver *behaviour* on the road is determined by *driver competence*, which includes basic capacities and learned driving skills, and by *driving-related motives*. As well as affecting driving behaviour, motives affect *exposure to crash risk* (see Macdonald, 1992a for an expansion of this model of the determinants of crash risk).

Licensed drivers vary in their crash risk due to varying combinations of exposure, motives and competence levels. It is well documented that young, inexperienced drivers have a crash risk per distance driven which is considerably higher than average, as do the oldest drivers. Crash risk of drivers with disabilities is much less well documented, but is known to vary with type of disability (see 1.2 below).

Crash risk per distance driven represents the risk which an individual faces when actually on the road. It is this risk which is affected by driver competence, and which may influence individual decisions affecting level of exposure. From a community perspective, however, crash risk per year is more meaningful than per distance driven, since it represents the absolute magnitude of risk, taking account of riskiness of driving *and* of the amount of exposure to risk. The driver licensing system operates to maintain road safety by limiting the exposure of high risk drivers, whether by denying them a licence completely, or by placing conditions on the licence which limit the exposure of high-risk drivers such as the very inexperienced (through a graduated licensing system) or drivers with specific disabilities (through special licence conditions).

1.2 CRASH RISK AND DISABILITY

Overall, the crash risk of drivers with only physical disabilities appears to be no higher than average, but that of drivers with cognitive disabilities is higher. A review of all the evidence is beyond the scope of the present report, but this general pattern is consistent (see Drummond *et al*, 1983; Functionally Impaired Drivers Working Party, VicRoads, 1992). Consistent with this, Jones *et al* (1983) reported that patients with no cognitive impairment had a lower on-road fail rate (11%) than those with cognitive impairment (46%); further, they noted that within the cognitively impaired group, the particular medical diagnosis was not predictive of driving competence. In Australia, Fox *et al* (1992) reported that non-brain-impaired drivers had a lower on-road failure rate (14%) than the brain-impaired (52%). Again, diagnosis was not a predictor within the latter group.

The crash risk of older drivers (aged 70 years and over) is of particular interest because of their rapidly increasing proportion within the driver population. Among older drivers there is a higher incidence of specific disabilities than among the overall population. In addition, the normal process of ageing degrades many of the basic capacities upon which driving depends, particularly speed of information processing and vision.

There is a very large literature on driver vision. For the general driver population, association between documented visual disabilities and crash risk is weak, although it has recently been suggested that the association has been underestimated in the past because of unreliable techniques of vision assessment (Schieber, 1988; Shinar and Schieber, 1991). There is also evidence that among older drivers, whose vision is typically poor, a *cognitive* limitation of visual field, termed useful field of view, is associated with increased crash risk (Ball and Owsley, 1991).

Thus, it would be expected that older drivers as a group would have a higher crash risk per distance driven; this is confirmed by crash data (e.g. Luchter, 1988; Cooper, 1990; Hull, 1991).

There is evidence that older drivers often cope with their higher risk per distance driven by limiting their exposure. For example, an American study of healthy older drivers aged more than 70 years found that those who had recently given up driving had more visual problems than those still driving (Kosnik *et al*, 1990).

However, such reduction of exposure to compensate for an increased crash risk does not always occur; at least, it does not always occur sufficiently to avoid an increase in absolute risk level. A recent study (Cooper *et al*, 1993) of 165 Canadian drivers diagnosed as having dementia found that they had a significantly higher crash rate than a carefully matched control group. Significantly, "...over 80% of the dementia group who experienced a crash event (and who were almost all judged at fault) continued driving for up to 3 years following the event, and during this time over one third of these had at least one more accident." (p.9)

There is a need for similar research to determine levels of exposure as well as crash risk for other forms of cognitive disability, particularly those likely to cause degradation of drivers' insight into the existence and behavioural impact of their own disabilities, such as some head injuries, or particular types of right cerebral vascular accident (stroke).

Concerning insight and self-perceptions of competence, Cooper (1990) compared the actual crash characteristics of Canadian older drivers with the perceptions of a sample of over 900 older drivers (aged 55 years and over). The drivers interviewed were aware of some their age-related driving problems, such as problems with turning manoeuvres or with bad weather, but they were evidently unaware of their high probability of being "at fault" in accidents: they considered themselves to be average or better in general competence, and they were apparently unaware of their relative incompetence in yielding right of way at intersections.

There have been some very small scale studies of the quantity and quality of exposure to crash risk of drivers following severe head injury, in the form of small follow-up studies of people who have passed through a rehabilitation centre (Simms, 1985a, 1985b; van Zomeren *et al*, 1988; Katz *et al*, 1990). These studies suggest that many of the small numbers of drivers involved reduced their exposure by avoiding drinking before driving, driving less at night, and generally drove more carefully. The numbers of drivers involved were too small to evaluate effects on crash risk. although van Zomeren *et al* (1988) commented that the crash record of one of their nine brain-damaged drivers was "impressive"!

Thus, some drivers with disabilities which decrease driving capacity may decrease their absolute level of risk by limiting their exposure. However, it appears that in cases where the nature of the disability degrades capacity for effective decision-making at the strategic level, such compensation does not occur. Even when it does, it may be inadequate to completely compensate for the reduction in competence, in which case absolute risk level, as well as risk per distance driven, will be increased.

1.3 DRIVER COMPETENCE AND DISABILITY: A Theoretical Framework

Within a traditional information-processing model of human performance, specific driver capacities may be categorised as:

- * *sensory capacities*, including touch and hearing but most importantly vision. Most of the incoming information that drivers need to 'process' is visual.
- * *perceptual/cognitive capacities*: the way in which people understand and interpret incoming information. An important driver characteristic in this category is information-processing capacity. If capacity is low, it can result in a driver focussing on only one thing at a time. Driving depends on being able to pay attention concurrently to a range of information inputs, and being able to allocate and focus attention appropriately, attending to things in the correct sequence, and concentrating for sustained periods if necessary.
- * *physical capacities*, such as strength, co-ordination, range of movement and motor response time. Adequate levels of such abilities are clearly required by drivers in order to control a vehicle.

The above three types of capacities underlie driving competence. Since driving is a highly skilled activity, the functioning of these basic capacities and related components of skill become 'automated' and subsumed within a hierarchy of capacities and higher-order skills.

Michon (1979) described driving in terms of three hierarchical levels of behaviour: operational, tactical and strategic. This model is very similar to the 'SRK' (skills, rules, knowledge) hierarchical model of Rasmussen (1980; 1987), which Hale and Glendon (1987) used in combination with the conventional three-stage model of information processing (information input, central processing, response) to produce a nine-cell matrix which served as a theoretical framework for their extensive analysis of accident-related behaviour.

For the present purpose the most appropriate framework appears to be a combination of Michon's specifically driving-related hierarchy of operational, tactical and strategic levels of behaviour with the three information processing stages to produce a nine-cell matrix similar to that of Hale and Glendon (1987).

	Information Input	Central Processing	Response
Operational Level	1	2	3
Tactical Level	4	5	6
Strategic Level	7	8	9

1.3.1 Operational Level Performance

Performance at the operational level (cells 1,2,3) requires no conscious attention. It represents the basic "building blocks" of higher-order driving performance, including the basic capacities at each of the three stages of information processing which were listed above.

In addition, many learned components of driving skill are executed "automatically" by experienced drivers in routine situations, which means that they are categorised as operational behaviour. These include, for example: visual scanning of traffic and environment (cell 1), patterns of attention allocation, interpretation of incoming information in terms of learned 'mental models' of traffic system operation which incorporate both formal and informal knowledge (cell 2), motor skills such as gear-changing, braking, etc. (cell 3), and the perceptual-motor skills which underlie the routine maintenance of vehicle speed, lateral position and following distance (cells 1,3).

Such capacities and skills have been extensively evaluated, usually in off-road tests, and many studies have shown major deficits in drivers suffering from various forms of cognitive deficits (e.g. Sivak *et al*, 1981; Jones *et al*, 1983; Sivak *et al*, 1984; Kewman *et al*, 1985; van Zomeren *et al*, 1988; Engum *et al*, 1988; 1989; 1990).

There appears to be no published research relating specific deficits in physical motor capacities to on-road driving performance, presumably because there is no need for such investigations since crash data show no increased risk of such drivers being involved in crashes. It should be noted, however, that the presence of physical disability does not mean that crash risk is no higher than normal: some forms of physical disability are commonly associated with significant cognitive disabilities, for example, stroke, cerebral palsy, Parkinson's disease and multiple sclerosis.

1.3.2 Tactical Level Performance

Driving behaviour at the tactical level entails some conscious attention, and almost invariably incorporates components of all three stages of information-processing. Such behaviour includes overtaking, changing speed in response to a change in speed zone, and in general modifying driving behaviour in accord with changing traffic and environmental conditions.

The perceptual-cognitive-motor skills identified at the operational level for routine driving situations are also represented at the tactical level when the situation demands more attention. For example, vehicle speed, lateral position and following distance are varied as part of manoeuvres such as lane changing prior to turning, reducing speed on approaching a busy shopping centre, and overtaking.

A central processing component is always present in driving behaviours at the tactical level, since by definition it entails some conscious attention, but tactical behaviours differ in the relative importance of sensory, central processing and response stages. Examples of predominantly sensory behaviour at the tactical level (cell 4) include variation in patterns of eye movements and rear-vision mirror use in response to different traffic manoeuvres. It should be noted that both these examples also apply at the operational level for manoeuvres and situations which are routinely encountered.

Tactical behaviour which is predominantly 'central processing' in nature (cell 5) includes varying patterns of attention allocation (e.g. to traffic signs, to pedestrians, to emergency vehicles) in differing traffic situations, and adoption of a conscious strategy of maintaining speed within the legal limit in an area where enforcement is expected. Examples of tactical behaviour which is predominantly 'response' (cell 6) are difficult to identify, since most motor components of driving skill appear to be performed without attention and are thus at the operational level.

The driving behavioural characteristics observed in experimental studies of drivers suffering cognitive deficits demonstrate deficiencies in behaviour at this level (e.g. Bardach, 1971; Shore *et al*, 1980; Quigley and DeLisa, 1983; Jones *et al*, 1983; Hopewell and Price, 1985).

1.3.3 Strategic Level Performance

Behaviour at the strategic level is largely confined to cell 8, central processing, representing strategic decisions whose main influence on driving is to modify level of exposure to crash risk. Examples include decisions concerning when, where and under what conditions to drive, such as choosing a route, avoiding night-time driving, and minimising consumption of alcohol before driving. Perhaps a decision to wear glasses when driving at night might be classified in cell 8, and a decision to drive a car with automatic gears or power steering might be classified in cell 9.

It has been suggested (Engum *et al*, 1988) that since drivers suffering cognitive deficits due to head injury typically suffer from poor planning, poor judgment, impulsivity and impaired insight, their strategic decision-making is probably adversely affected. However, as noted in 1.2 above, there is a very small amount of evidence to suggest that at least some head-injured drivers, following extensive rehabilitation, have sufficient insight to modify their strategic decision making to compensate for their degraded capacities.

As van Zomeren *et al* (1988, p.95) pointed out,

"This compensation can be explained from the hierarchic nature of the driving model. By making the right decisions on the strategic and tactical levels, subjects can to a large extent avoid time pressure. This subject had the longest choice reaction times of all patients, but the (on-road assessor)

noted that he was very good in 'anticipatory driving', adapting his speed and manoeuvres to developments and situations to be expected in the immediate future."

The authors suggested that objective tests need to be developed for behavioural characteristics such as lack of self-criticism and impulsiveness, to enable valid and reliable prediction of the extent of probable compensation at both the strategic and tactical levels in people with cognitive disabilities.

1.3.4 Implications for Assessment

Basic capacities and higher-order components of driving skill both need to be assessed when evaluating driver competence, in addition to directly assessing on-road performance.

However, it is evident that driving capacities, skills and behaviour are not distributed uniformly within the above evaluation matrix; this distribution should be reflected in the differing weights given to assessment of different aspects of driving behaviour. For example, since cognitive behaviour (at the 'central processing' stage) is clearly of great importance, the assessment system should incorporate a thorough assessment of the cognitive aspects of driving, ideally covering all three hierarchical levels.

A disability may affect only one of the specific, operational capacities which underlie driver competence (e.g. only physical strength, or only vision), or it may affect several specific capacities (e.g. vision, short-term memory and ability to allocate attention appropriately). An assessment system for drivers with disabilities needs to be sufficiently comprehensive to determine the nature and extent of effects on driving behaviour of a wide range of different types of disability, at varying levels of severity.

1.4 THE ROLE AND GENERAL FORM OF SPECIALIST DRIVER ASSESSMENT

1.4.1 *Prediction of driving competence based on medical condition*

Throughout the world, most current legislation related to drivers with disabilities appears to be based on the implicit assumption that medical condition is the best available indicator of driver competence in the case of drivers with specific disabilities. Pidikiti and Novack (1991) in a paper entitled "The disabled driver: an unmet challenge" expressed concern at the current situation in the USA, where there is a lack of common guidelines across states "to ensure reevaluation of individuals with disabling conditions" (p.109). Only 15 states have laws authorising the reporting of disabled drivers (always by a physician); seven of the 15 *require* doctors to report such drivers. The medical conditions specified as reportable vary between states. General practice is for reported cases to be evaluated by a state medical advisory board.

The Australian situation is similar in that medical practitioners are generally seen as the health professionals with primary responsibility for "Determining Fitness to Drive a Motor Vehicle" (Department of Transport and Communications, 1988). In fact, medical practitioners do not have legal responsibility for determining "ability to drive"; that rests with the appropriate licensing authority (Department of Transport and Communications, 1988, p.1-1).

However, implicit in the reporting system is the reasonable view that medical condition is predictive of driving disability. Van Zomeren *et al* (1987) suggested that, in addition to the general diagnosis, "Variables that might have some predictive value include severity of disease or injury, duration of illness, rate of progression in diseases like Alzheimer or Parkinson disease, age of the patient ..." (p.700). Unfortunately, empirical data on the predictive value of such information indicate that it is more unreliable than is generally appreciated. For example, Jones *et al* (1983, p.758) found in a study at a New Zealand hospital rehabilitation centre specialising in driver assessment that where brain damage is suspected or known to be involved, "A low 13 percent correlation between diagnosis and outcome indicates the variability with which certain critical impairments (sensory, motor, perceptual, cognitive, behavioural) appear within certain diagnostic categories."

The clearest evidence of the limited predictive value of expert medical opinion is that reported by Fox *et al* (1992). In a large, longitudinal study carried out at a Sydney rehabilitation centre specialising in driver assessment, each of 129 clients went through a four-stage assessment, unless failing the initial "medical". First, a registrar in rehabilitation medicine conducted a neurological examination, together with simple tests of vision, memory and basic mental functioning; each patient was evaluated in accord with the NSW Road and Traffic Authority Medical Guidelines (1990). Only 7 out of 129 "failed" by these criteria; the doctor passed 75, but classified another 47 as uncertain.

All except the 7 clear failures were then assessed by standard tests of perceptual and cognitive functioning administered by a neuropsychologist, by standard occupational therapy off-road tests, and finally by an occupational therapy on-road assessment. Of the 75 passed, 8 failed the perceptual-cognitive test battery and another 12 failed the on-road assessment. Of the 47 "uncertains", 17 failed the perceptual-cognitive tests and a further 12 failed on-road. Of the total 129, a specialist medical examination was inadequate to assess driving competence in 67 of the 129 cases (assuming that the 7 purely "medical" fails were validly categorised).

The above results were obtained in ideal circumstances for effective medical evaluation: the doctor concerned was a specialist in rehabilitation medicine, working within a specialist facility. In practice, medical evaluations are likely to be performed by a variety of doctors, most of whom are not particularly expert in this area. Nouri and Lincoln (1992) reported from a British study that stroke patients are commonly assessed by their own GPs, whose advice is based on very subjective criteria; a survey of GPs demonstrated inconsistencies in their interpretation of guidelines and the criteria actually adopted. Thus, the average predictive value of medical evaluations is likely to be lower than that found by Fox *et al* (1992).

Such findings are consistent with many comments from researchers in the literature, noting the difficulty or impossibility in many cases of predicting actual performance based purely on medical evidence, particularly where there is some cognitive disability. Van Zomeren *et al* (1988, p.90) commented in their extensive review of research findings that "At present, the statement in the AMA Guides for Physicians (1968) still holds: neurologically impaired persons are difficult to evaluate for fitness to drive."

It is largely because of this situation that special assessment systems have been developed for drivers with known or suspected disabilities.

1.4.2 Role of specialist driver assessments

In normal driver licence testing, the capacities and sub-skills which underlie safe driving performance are directly assessed only by a simple check of visual capacity, and by tests of knowledge related to road laws and some safety issues. The major focus of normal driver licensing is the on-road assessment of driving behaviour itself.

In assessing drivers with known or suspected specific disabilities, much more emphasis than in normal licence testing is placed on the prior assessment of underlying capacities. The on-road assessment is also different in that its main purpose is to determine the extent to which the diagnosed disabilities affect driving performance.

Referring to the current situation in North America, Galski *et al* (1992, p.324) wrote that "Rehabilitation professionals, typically occupational therapists in most facilities, are required to evaluate and render an opinion about the driving potential of cerebrally injured patients." Referring to the British situation (true also of continental Europe), Simms (1985b, p.363) commented that "Cognitive assessment is traditionally the province of the psychologist, although many occupational therapists are skilled in the assessment of perceptual difficulties." In Australia it is largely occupational therapists who are the responsible specialists. In cases of physical disability, physiotherapists may also be involved, although they are unlikely to assess on-road driving performance.

Regardless of the particular health professional involved, there appear to be three main reasons why a normal licence testing procedure may be unsuitable or inadequate for drivers with specific disabilities.

First, in the case of physical disabilities there is a risk that some licence testers, without specialist training, may be inclined to assume incorrectly that an apparently severe disability is bound to increase crash risk; they may therefore be unduly harsh in their evaluation of actual driving performance.

Second, drivers with physical disabilities are likely to need special adaptations to their vehicles. The specification and fitting of such adaptations requires specialist assessment to ensure that they are compatible with the individual's particular disabilities. These first two issues are concerned with providing an equitable assessment for the individuals concerned; road safety is not a relevant factor.

The third reason for a special assessment concerns perceptual and/or cognitive disabilities, and in this case safety is an important consideration, both for the individual concerned and for the community. A specialist assessment is necessary in cases of perceptual and/or cognitive disabilities because many of the effects of such disabilities on driving performance would not be apparent in a standard licence assessment. Since cognitive disabilities are associated with a raised crash risk (see 1.2 above), a specialist assessment is required to determine the nature and extent of deficits in underlying capacities, and the extent to which such deficits affect driving performance.

1.4.3 The general form of specialist assessments

The essential feature of specialist assessment procedures for drivers with disabilities is that they incorporate a range of off-road tests for specific capacities known (or assumed) to be important for driving, such as vision, information processing rate, capacity to allocate attention appropriately, strength, etc.

Specialist assessments sometimes also incorporate off-road tests of driving 'sub-skills', the performance of which depends on the more basic capacities. Such skills include perception of driving hazards (using slides, photos, videos, etc), and performance of tracking tasks; they might be tested in a clinic using special

equipment, or in the case of motor skills, in a vehicle using an off-road testing area.

It is only when drivers have demonstrated the adequacy of their basic capacities and perhaps some driving 'sub-skills' that their driving performance itself is assessed on the road. On-road assessment usually starts in a very quiet, relatively safe area, proceeding to more complex and demanding traffic situations if appropriate. Thus, specialist testing should serve both to provide a more valid and sensitive test, and to protect the safety of all concerned.

1.5 FRAMEWORK OF THE PRESENT REPORT

The remainder of the report is organised as follows. Section 2 specifies and discusses the requirements for valid and reliable driver assessment; relevant literature is discussed, both in general terms and as it applies specifically to drivers with disabilities.

Section 3 documents information on current Australian practice in the specialist assessment of drivers with disabilities. Information is presented from a mail survey of trained assessors, from personal interviews with assessors in every Australian state and territory, and from state licensing authorities. Based on this information, the general nature of current Australian practice is summarised.

Section 4 evaluates current practice within the framework established in Sections 1 and 2. Practice is evaluated in terms of its content, which is the primary determinant of validity, and in terms of the procedures employed, which are the primary determinant of reliability.

Section 5 summarises changes required to the current Australian system to achieve "best practice" in the assessment of drivers with disabilities.

An Executive Summary is presented at the beginning of the report.

2. REQUIREMENTS FOR VALID AND RELIABLE DRIVER ASSESSMENT

Validity and reliability are two essential requirements of any system of driver assessment, whether for normal driver licensing or for the special assessment of drivers with disabilities. These characteristics are discussed below, incorporating material from Macdonald (1992b; 1992c).

2.1 VALIDITY

Validity is an essential requirement of a test of an individual's driving capacity: level of test performance must be meaningfully related to driving performance. There are various forms of validity.

Predictive validity is shown by a significant relationship between test performance and subsequent driving performance. Predictive validity is probably of most basic importance; ideally, we would like to be able to predict 'real world' driving behaviour, particularly an individual's crash risk, on the basis of test performance.

Criterion validity is shown if the test performance of a group of people established by *some external criterion* (e.g. crash rate) as having a low capacity is significantly lower than the test performance of a matched group of people established as having average capacities who in turn should score lower than a matched group of people established as having a high capacity.

Construct validity is particularly desirable in the case of performance measures for which there is no clear external criterion of validity. This is true in the case of driving competence, since it is difficult to establish the predictive validity of measures of driving competence in terms of crash rate. Therefore, tests of driver competence ought to be validated in terms of a theoretical model which defines the nature of driving competence. The framework established in section 1.3 above is intended to fulfil this purpose.

Content validity is achieved by incorporating in the test a representative sample of components of the activity in question, such as actually driving a car in traffic. McKnight and Stewart (1990) provided a very comprehensive description of the individual items of behaviour which constitute actual driving. Unfortunately, practical constraints of time and money preclude the adoption of a test incorporates most of the items documented in this description; the list of behavioural components is simply too extensive.

A test with content validity tends also to have *face* validity: that is, it gives the appearance of being a valid test. A test which has some predictive validity but which lacks face validity is likely to encounter problems in gaining acceptance from the client population. On the other hand, content validity does not guarantee the existence of other forms of validity, and a test with *only* content

validity may be of little or no practical value. For the present purpose content validity is not of critical importance and will not be considered further.

2.1.1 General Difficulties in Achieving Validity

Choice of tests to predict ability to drive competently demands detailed knowledge of the capacities which are actually required for competent driving. In a complex activity such as driving, this presents problems for the assessor - a difficulty also experienced in occupational work capacity evaluation. Many jobs demand capacities for which tests are not administered, either because such tests do not exist, or because the importance of that capacity is not recognised and so an inadequate battery of tests is chosen (see Sen *et al*, 1991). As a consequence, performance capacity evaluations, whether for job-related activities or for driving, often lack predictive validity.

In the case of normal driver licence testing, extensive research has revealed remarkably little evidence of either the predictive or criterion validity of the most commonly encountered forms of driver licence tests (see Macdonald, 1987, McKnight and Stewart (1990), and Macdonald *et al*, 1992a, for reviews). Results have generally been negative. Part of the problem is undoubtedly that our knowledge of drivers and driving is inadequate for the development of a valid test - we are unable as yet to give a clear and comprehensive description of the precise nature and determinants of safe or unsafe driving behaviour. Research is continuing; in the meantime, most existing licence tests can claim only some content validity; levels of construct, criterion and predictive validity are usually either unknown, or known to be very low.

It should be noted that predictive validity *per se* is not necessarily evidence of a direct, causal relationship between test performance and subsequent "real world" performance, and information which is statistically predictive of performance capacity is not necessarily appropriate for practical use. Thus, a battery of personal information on factors such as a person's age, sex, level of education and socio-economic status may well have higher predictive validity than most performance test scores. However, for ethical and social reasons such information would not be acceptable in lieu of a more direct evaluation of performance capacity.

2.1.2 Demonstrating Predictive Validity

There are three major problems in determining predictive validity, that is, in demonstrating a high positive correlation between levels of test performance and subsequent 'real world' performance.

First, demonstration of predictive validity requires an adequate means of evaluating "real world" performance. In the case of driver testing, evaluation of driving performance subsequent to the test is most commonly in terms of accident record; driving convictions may also be considered. However, both these measures are inadequate because they are very rare events in the experience of any individual driver: they are therefore very insensitive and hence inadequate measures of performance. Unfortunately there are no more direct measures of driver performance which would provide both practicable and acceptably valid indices of the quality of performance.

The predictive validity of *off-road* tests for drivers with disabilities can to some extent be evaluated in terms of subsequent *on-road* (in traffic) test performance. There are now quite a few published cases where this has been achieved, to varying degrees (Sivak *et al*, 1981, 1984; Jones *et al*, 1983; Croft and Jones, 1987; Cimolino and Balkovec, 1988; van Zomeren *et al*, 1988; Engum *et al*, 1988, 1990; Fox *et al*, 1992; Galski *et al*, 1992; Nouri and Lincoln, 1992). The theoretical magnitude of correlations between off-road and on-road test performance in an ideal testing system is by no means clear, given that on-road performance is more than simply the product of its lower-order components. Nevertheless, a significant positive correlation is clearly desirable from a practical viewpoint.

The second barrier to demonstrating on-road predictive validity is that it is ethically unacceptable to allow people who perform very poorly in a test intended to predict subsequent driving performance, to proceed to driving under normal conditions simply so that their expected poor performance can be demonstrated and the predictive validity of the test confirmed. Poor performance may result in serious injury to the person concerned, and may present serious risks for others. Indeed, Jones *et al* (1983, p.759) commented that "... a need to validate off-road test results and a tendency to give patients every benefit of the doubt, has resulted in too many near accidents. ... off-road tests will continue to improve in terms of ... justifying fail recommendations without the need for on-road verification." In such circumstances, experiments to assess the predictive validity of the evaluation procedure are not advisable.

Third, behaviour is determined by motivation as well as by competence. Hence, when motivation varies greatly between test and real-world conditions, as is usually the case with driving, it is unrealistic to expect driving test performance to indicate more than level of competence, and in the normal driver population competence may not vary sufficiently to be a major predictor of accident involvement. However, among a population of people with specific disabilities, levels of competence would be expected to vary a great deal more, with a correspondingly greater variation in performance under test conditions. Theoretically, it should be easier to achieve predictive validity of an assessment system for such drivers than is the case for the whole driver population.

2.1.3 Demonstrating Criterion Validity

To demonstrate such validity requires data on the range of performance scores achieved on the test by a population of people known by some external criterion to be capable of performing the activity (in this case driving) successfully. It is essential that normative data are available for a test, to enable proper interpretation of test scores.

Thus, in applying special tests to drivers with disabilities, normative data are needed from a comparable group of drivers without disabilities, so that the performance of the disabled group can be evaluated equitably. For standard tests of basic visual, perceptual-cognitive and physical capacities, normative data are documented in the professional literature of the areas concerned (optometry, neuropsychology, occupational therapy and physiotherapy). However, for off-road tests of driving-related capacities such data are less generally available. They have been reported by Sivak *et al*, 1981; Croft and Jones, 1987; van Zomeren *et al*, 1988; Gouvier *et al*, 1989; Engum *et al*, 1990; and Macdonald *et al*, 1992.

In only three cases has normative data been obtained for on-road as well as off-road driver tests, by Sivak *et al*, 1981; van Zomeren *et al*, 1988; and Engum *et al*, 1990.

The study by Macdonald *et al* (1992b), which produced a performance data on the off-road tests taught by the Victorian occupational therapy driver assessment system, was too small in scale and limited in scope to provide a sound basis for the interpretation of Australian off-road test scores. In Australia as well as elsewhere, further work is needed to establish appropriate test norms; the need is especially great in the case of on-road assessment.

2.1.4 Demonstrating Construct Validity

Construct validity for both off-road and on-road tests appears to be best assessed in terms of a conventional information-processing view of driving within a broader framework of the Michon (1979) hierarchical model, as outlined in 1.3 above.

On this basis, off-road assessment should focus on operational capacities and sub-skills. It should include the basic sensory, perceptual-cognitive and motor capacities, assuming that they have predictive validity in relation to on-road competence. It should also include tests of as many operational skill components as can be tested and shown to have predictive validity. Van Zomeren *et al* (1988) suggested that off-road tests should also be developed to obtain objective information about behaviour at the strategic level, since this is not observable on-road.

On-road assessments should focus on documenting behaviour at the tactical level, together with those operational sub-skills which are directly observable: that is, vehicle control skills, use of indicators, etc. It is difficult in an on-road test to assess perceptual and cognitive operational skills reliably; these are probably better assessed off-road.

2.2 RELIABILITY

Reliability is necessary for the results of testing to be "fair", and thus able to withstand the legal challenges which are increasingly likely (see Antrim and Engum, 1989). Along with validity, reliability is arguably the most basic requirement of a test. A reliable test produces a reasonably consistent outcome, given a constant level of actual performance by the person being tested. Outcome should not be affected by variation between different testers, or by variation between different testing occasions.

While some assessors of drivers with disabilities have acknowledged the importance of reliable test procedures, research to demonstrate the types of procedure needed to achieve reliable driver assessments has been confined to the area of standard driver licence tests. It has recently been comprehensively reviewed by Macdonald (1987), McKnight and Stewart (1990), and Macdonald *et al*, (1992a). Two main conclusions emerge which are important in the present context: first, conventional test procedures are unreliable; second, reliable testing is practicable and has been achieved by forms of test which meet specific criteria.

2.2.1 Conventional driver licence tests are unreliable

In recent years there has been a considerable amount of research investigating the reliability of driver licence test procedures, and it is well established that most licence tests throughout the world are currently of a type known to be unreliable. Professional driving testers are inconsistent in what they judge to be important for safe driving and what they therefore penalise in licence tests. An American study (Vanosdall *et al*, 1977) investigated the decision-making processes of licence testers using their existing system in which they simply gave each candidate driver a pass or a fail with no quantitative scoring.

For some testers, the basis for the decision to fail an applicant seemed to be a 'gut feeling' associated with perceived risk; often this was strongly influenced by vehicle-handling skill. Other testers were more influenced by what they perceived to be risky actions that made them afraid of an accident. In contrast to these intuitive examiners, others used a legalistic framework. To them, behaviour at stop signs, give way signs, etc. was important and minor right-of-way violations, observance of speed limits, turning from the wrong lane, etc. were used as the basis for their decision.

In line with this wide variation between expert assessors in their informal strategies and evaluation criteria, recent studies in Victoria and in California of the performance of groups of licence testers found great inconsistency.

Fabre *et al* (1988) reported the results of an analysis of over 16,000 Victorian licence test score sheets from the early to mid 1980s. Large and consistent differences in scoring patterns were found between different licence testing officers (LTOs). LTOs differed from each other significantly both in the percentage of applicants they passed, and the frequency with which they penalised applicants for different types of errors. Thus, among the 68 LTOs whose records were investigated, average pass rates varied from 55% to 97%. Taking the error category 'Starting' as an example of one of the specific error categories, it was found that the frequency with which different LTOs recorded errors in this category ranged from 0% of tests to 99% of tests.

It should be noted that the testers in the above study were using a highly structured score sheet; clearly, structure *per se* does not necessarily produce reliable outcomes.

From this evidence it was clear that the reliability of the then current Victorian on-road licence test was very low. There has since been widespread recognition of the need for greater reliability in licence testing. For example, McKnight (1989) wrote that:

"Where the purpose of a ... test is solely educational, and the results will simply be used to improve performance, inconsistency is not of concern. However, when a license is at stake, consistency is paramount. First, a test that gives inconsistent results cannot be valid. Examiners cannot give different scores and all be correct. Second, an inconsistent test cannot be fair, and fairness is probably as important to the average citizen as validity." (McKnight, 1989, p.6)

McKnight and Stewart (1990) found a similar situation to exist in California as was found in Victoria. For a sample of 25 licence testers, pass rate ranged from 28.5% to 100%, and a highly significant interaction was found between examiner and the frequency of recording particular error types. Thus:

"It was common for the same error to be observed in only 10% or 20% of one examiner's subjects, while another observed the same error in 50% or 60% of the subjects. Some errors were observed over 80% of the time by some examiners and never once by others." (p.62)

The form of the analysis made clear that this variation between examiners in the types of errors recorded was not associated with differences between testing stations. Very clearly:

"... the tendency for different examiners to see different errors is a function of the examiners and not the types of applicants they test." (p.62)

Macdonald (1987) and McKnight and Stewart (1990) each recommended changes to improve the accuracy and uniformity of the licence testing process. Commenting on the large differences among the pass/fail rates of different examiners in the same testing office, as well as between different offices, McKnight and Stewart stated that:

"These differences in failure rates resulted primarily from wide differences in the types of driver errors that different examiners reported. It was apparent that examiners tended to have 'pet' errors that they were on the look-out for." (p.126)

To overcome this problem a fundamental change in the test procedure was proposed, "calling upon examiners to observe *specific performances* at *designated points* along a test route." (p.126)

The same recommendation was made by Macdonald (1987). Such a testing process has been trialed in Michigan, U.S.A., was implemented in Norway during the 1980s (see Glad (1984), and is currently being implemented in New Zealand.

2.2.2 Reliable on-road tests are achievable

Research evidence demonstrates that on-road driver testing *can* be carried out with reasonable reliability. To be reliable, it is essential that the test procedure:

- follows a standard, pre-determined route
- scores pre-determined aspects of behaviour at pre-determined points along the route
- follows a closely-defined scoring procedure.

McKnight (1989) reported a small but well controlled study which aimed to answer the question:

"What is the relative effect of programmed vs. extemporaneous observations upon:

- * Inter-observer reliability, as reflected in the degree of agreement between different examiners observing the same performance*
- * The validity of the observations, as determined by the correlation of observed performance with a record of actual road test performance." (p.6)*

In this study 16 licence testers, divided into two equal groups, observed a videotape record of motorcycle licence applicants taking road tests. One group were free to look for and record errors regardless of where they occurred (extemporaneous observations), and the other group were taught to look for specific errors at preselected points along the route, using 'programmed observations' as specified by the Motorcyclist In Traffic test (MIT; McPherson et al, 1978). They were all experienced in motorcycle licence testing but were

unfamiliar both with the route shown on the tapes and with the method of programmed observations.

The 'actual performance' of each applicant was determined by researchers observing all of the videotape in detail, and recording *all* errors which occurred anywhere along the route. These errors were scored according to the MIT scoring criteria.

The validity of the two groups of examiners' scores were then evaluated in terms of their correspondence to the researchers' record of actual performance. Total scores of examiners were correlated with these criterion scores; correlations for examiners using the programmed observations averaged 0.36 (0.41 if one aberrant examiner was excluded), as compared with 0.24 for the extemporaneous observations group ($p < 0.01$).

As expected, examiners scoring on the basis of programmed observations (and therefore confining their attention to pre-determined locations), tended to under-report errors relative to actual performance (mean of 4.1 compared with 7.0 per test). Extemporaneous observations, on the other hand, were associated with over-reporting (7.5 compared with 7). Rather disturbingly, errors reported by the latter group were not necessarily actual errors; these examiners frequently reported errors in categories where detailed analysis of the videotape showed that no error occurred.

The reliability of examiners' scoring was evaluated by correlating scores within each group of eight. The average correlation for the programmed observations group was 0.42, and for the extemporaneous observations group it was 0.29 ($p = 0.02$).

Reliability was also assessed by an analysis of variance for programmed and extemporaneous test scores. Both scoring systems produced larger variance among examiners than among subjects' actual performance. However, the effect of examiner differences on test scores was considerably smaller in the programmed observations group. Ratio of examiner/applicant variance with programmed observations was about 2/1, whereas with extemporaneous observations it was about 5/1.

Conclusions from this very well designed study were:

- "1. Current road testing practices lead to low correspondence between examiner scores and actual applicant performance, resulting in low agreement among examiners and consistent differences in examiner scoring practices, i.e. examiner bias.
2. The use of programmed observations leads to closer correspondence between examiner scores and actual applicant performance, leading to higher agreement among examiners and reduction in the magnitude of examiner bias.

3. *License administrators need to institute periodic reviews of examiners to detect the nature and extent of examiner error and to provide the training and supervision needed to increase the accuracy of examiner scores.*
 4. *To be effective, programmed observations need to be accompanied by extensive examiner training and practice test administration."*
- (McKnight, 1989, p.9)

Consistent with these recommendations, a 'set route, systematic observations' form of standard on-road licence test (the Car On Road Test - CORT) was trialed in Victoria during the late 1980s. The CORT was based on the ADOPT, a test developed by McPherson and McKnight (1981). The ADOPT was one of the three recommended by Macdonald (1987) for further evaluation and possible implementation in Victoria. The CORT was trialed and developed in Ballarat and Dandenong. In spite of being found to be equally or more reliable than the ADOPT, practical difficulties in implementation lead to the trial being terminated. However, implementation of testing systems such as this is currently being pursued in some other Australian states.

2.2.3 Reliability of Assessments of Drivers with Disabilities

Some of the research on methods of assessing drivers with disabilities, while generally focussing on validity, has also addressed the issue of reliability.

Jones *et al* (1983, p.754) recognised the "low objectivity, low reliability" of New Zealand (and other) on-road assessments, and Croft and Jones (1987, p.358) commented that on-road assessments of several higher mental functions recognized as important to driving was carried out subjectively, and that "... other important factors, such as awareness of impairment, ability to cope with demanding situations and attitude, can only be gauged through observation and experience", which is unlikely to be very reliable.

Gouvier *et al* (1989, p.745-746) wrote that "One crucial flaw in most research on driving ... has been a failure to demonstrate reliability of measurement in the criterion variable of actual driving performance." Also, Galski *et al* (1990, p.709) noted that "On-road evaluations have been regarded as a direct measure of driving abilities. Unfortunately, these evaluations are often lacking in reliability and objectivity..."

In Australia, Macdonald *et al* (1992b) found that even a small group of occupational therapists who routinely administered standard off-road tests to evaluate the capacities of head-injured drivers within the same rehabilitation hospital had developed significantly different testing and scoring procedures, such that the reliability of the tests appeared to be compromised. (This situation is confirmed by the results of the survey and interviews presented in the present report.)

In part, this unreliability probably stemmed from the lack of normative data for interpretation of scores from the currently used Australian off-road tests. Macdonald *et al* (1992b) reported that therapists valued the tests primarily as a means of eliciting behaviour from which clinical impressions could be formed. These impressions were noted informally on the test score sheets. The over-all judgement of the therapist concerning the outcome of the assessment was strongly influenced by such clinical impressions, rather than being determined on the basis of particular test scores. In the absence of normative data, such a use of the test is not surprising. The parallel with the view of driver licence testers, as described in the quote from McKnight and Stewart (1990) above, is striking.

2.2.4 Greater test reliability may be at the cost of some job satisfaction

Some light may be cast on part of the reason for the abandonment of the Victorian trial of the CORT by a quote from McKnight and Stewart (1990):

"It is apparent that many examiners do not view the drive test as an objective measure of competency itself but rather see it as a means by which a skillful examiner can judge competency." (p.62)

Given that this is probably a common attitude among Victorian LTOs (and, indeed, among expert evaluators of performance capacity in other spheres), it is not surprising that the CORT was not immediately popular with them. Tests which impose systematic procedures to structure and perhaps simplify decision-making inevitably decrease the perceived autonomy of the people using them. The more structured forms of driver licence test give individual testers less scope to exercise what they perceive as their skill in judging driver competence. The perceived loss of autonomy would be expected to produce lower levels of job satisfaction (see, for example, Lansbury and Prideaux, 1980).

In view of this, it is clear that the way in which such a test is introduced and implemented, and concomitant changes to the job design of those expected to use the test, will be critical in determining its level of acceptance. The introduction of a more 'programmed' and systematic testing procedure is unlikely to produce significant improvements in test reliability unless it is supported by an extensive, and probably ongoing, training program for its users. The importance of this was particularly clear when such a test was first introduced in Norway (Glad, 1984).

Reliability is probably even more important in the assessment of drivers with disabilities than in the case of normal licence testing, since clients with disabilities are likely to be more badly affected by an inappropriate "fail" outcome. Given the high level of education and training required for health professionals such as occupational therapists, and the intrinsically tedious nature of simply following a standard procedure, which is the only way in which reliability is achievable, it may be desirable to work towards a system in which non-professional but specially trained staff administer tests under the supervision of professionals. This strategy has been reported by Engum *et al* (1988) as an effective means of assessing drivers with disabilities.

Regardless of these problems, reliable test procedures are essential. Antrim and Engum (1989, p.19) pointed out that:

"... health care professionals will want to show that they adopted and utilized reliable and valid assessment techniques. ... Depending only upon general impressions or intuition in assessing the patient's ability to operate a motor vehicle is no longer reasonable professional conduct."

3. CURRENT AUSTRALIAN PRACTICE IN THE ASSESSMENT OF DRIVERS WITH DISABILITIES

3.1 METHOD

Data were collect by means of a mail survey, and a series of personal interviews.

3.1.1 Mail Survey

Target Population

The survey was mailed to all of the 89 occupational therapists throughout Australia who were known to have been trained as specialist driver assessors. Numbers broken down by state and territory were as follows.

Victoria	47
N.S.W.	33
A.C.T.	1
Queensland	2
Tasmania	3
South Australia	-
Western Australia	2
Northern Territory	1

Survey Content

The survey was designed to obtain information on the following:

Experience of assessors in driver assessment

Overview of assessments performed (level of recent assessment activity; diagnostic categories of clients)

Off-road assessment procedure (initial interview and screening, vision, range of movement, strength and tone, balance, sensory functioning, pain, brake reaction test, slide assessment test, road law test, other)

On-road assessment procedure (development and use of set routes, data recording method and type of information recorded, role of driving instructor).

The survey form is shown in Appendix 1.

Response Rate

In all, 53 surveys were returned, of which 10 were incomplete due to the infrequent nature of the respondents' assessment activities. Follow-up phone calls ascertained that of the remaining 36 people, 27 had changed jobs: 12 of these were no longer conducting driver assessments and 15 could not be contacted. Deducting from the initial 89 trained assessors those who now rarely or never conduct assessments, and those who had moved and could not be contacted, the response rate was 43 out of 62. The 19 "non-responses" included 8 survey forms which were returned completely blank, for no identified reason. Thus, the "return" rate was actually 51 out of 62. From these, 41 had been completed sufficiently to be analysed.

3.1.2 Personal Interviews and Observations

Purpose

The purpose was to obtain more detailed information than can be obtained by means of a mail survey, and to obtain information on actual practice, which is not always in accord with that specified. Personal interviews were conducted with assessors known to be active in the area; where practicable, interviews were accompanied by observations of actual assessments.

In addition to more detailed information on test procedures, the interviews sought information on:

- the general role played by OTs and other health professionals in the assessment of drivers with disabilities in each state/territory
- the general role played by the licensing authority in the assessment of drivers with disabilities in each state/territory
- the views of OT driver assessors on the advantages and disadvantages of different tests and the overall assessment procedure.
- the views of licensing authority staff on the existing system in their state/territory.

The Interviewees

Numbers interviewed in each state and territory were as follows.

	Trained O.T.	Untrained O.T.	Other Assessor
Victoria	9	-	1
New South Wales	5	-	-
Australian Capital Territory	3	-	-
Queensland	4	-	-
Northern Territory	1	1	1
Western Australia	-	3	1
South Australia	2	1	1
Tasmania	3	-	-

TOTAL: 36

Sampling rates were 100% in all states/territories except Victoria and NSW. That is, except in the latter two states, everyone known to perform assessments was interviewed. In NSW and Victoria those identified as most active in this field were interviewed. In Victoria, assessors in different types of facility in both urban and rural areas were sampled.

All were asked the same questions, with additional prompting to obtain clarification where required, except that six of the 36 interviewees were not questioned about off-road assessment procedures, since they only performed on-road assessments (the four non-OTs and two of the five untrained OTs).

Topics covered in the interview were:

- qualification of assessor
- types of disability of referred clients;
- tests used, and for each, procedure followed, within the following categories;
 - initial interview
 - visual capacity tests
 - other sensory capacity tests
 - motor response capacity tests
 - reaction time test
 - slide tests
 - road law written test
 - additional tests
 - on-road evaluation
- additional information sources
- opinions on future developments.

3.2 GENERAL NATURE OF ASSESSMENT ACTIVITY

Results from the mail survey and the interviews/observations are presented together, to avoid repetition in those areas where the content of the two overlap. Thus, some sections of the results are drawn solely from the survey, some are drawn solely from the interviews, and some present data from both the survey and the interviews. For each section of results, the source of data is identified.

Survey Data Analysis

The results for each survey question were tabulated, and cross-tabulations performed to investigate the effects of amount of experience as a driver assessor and possible effects of Melbourne versus Sydney training, on reported off-road and on-road assessment practices. Results of cross-tabulations are reported only where there was a significant effect.

3.2.1 Training and Experience of Driver Assessors

Survey

All survey respondents were OTs. Seventy-one percent had been trained in Melbourne, and 29% in Sydney; these figures reflect the fact that the Melbourne training course at the then Lincoln Institute of Health Sciences (now La Trobe University) commenced in 1987, whereas the Sydney course at Cumberland College (now Sydney University) did not commence until 1990. Fifty-four percent of respondents were trained prior to 1990, so there was a positive correlation between length of experience as an OT driver assessor and Melbourne training.

One third of respondents had some experience (most of them for less than two years) in driver assessment prior to their formal training as an OT driver assessor.

Interviews

Thirty-two of the 36 were OTs, of whom 27 had been formally trained in driver assessment by either the Victorian (12) or NSW (13) courses. Four non-OTs were interviewed: two driving instructors (VIC and WA), a mobility instructor (SA) and a driving instructor/nurse (NT).

Fourteen of the 27 trained OTs were trained in 1992; the other 11 were trained between 1987 and 1991.

3.2.2 Most Commonly Assessed Diagnostic Categories

	% of Assessors from survey	% of Assessors from interviews
Traumatic head injury	74	72
Cerebro-vascular accident, CVA	49	72
Orthopaedic	35	47*
Neurological degenerative disorder, and Poliomyelitis	22	61
Amputees	21	41
Spinal	20	36
Alzheimers and other elderly	19	58
Cerebral palsy	15	44
Delayed developments	8	39
Schizophrenia/ psychiatric	8	16
Cancer	8	-

** Interviews specified low back pain, 41% and occupational overuse, 9%.*

It was evident that most survey respondents commonly assess drivers across a range of diagnostic categories. The range of conditions reported by individual interviewees was greater than from individual survey respondents (as seen in the generally higher figures for the interviewees). This is probably because many of the interviewees (those in NSW and Victoria) were selected on the basis of their high level of driver assessment activity, whereas the survey was directed to all qualified OTs, regardless of their current level of activity.

3.2.3 Level of Assessment Activity

Survey

There was evidence of considerable variability among assessors in the number of assessments conducted. Numbers of assessments conducted in the last three months ranged from 0 to 33 (off-road) or 35 (on-road). Approximate quartile figures are shown below.

Numbers of Off-Road Assessments in last three months:

	0-2	3-6	7-11	12-33
No. of OTs:	9	11	10	11

Numbers of On-Road Assessments in last three months:

	0-2	3-8	9-13	15-35
No. of OTs:	11	10	9	11

Numbers of assessments reported for the last 10 days (presumably more reliable data than the above because of its greater recency), were consistent with the numbers reported for the longer period.

Interviews

Numbers of assessors completing off-road and on-road tests in each state and territory are tabulated below, for OTs and others separately.

	<i>Occupational Therapists</i>		
	Off-road	On-road	Number of OT's
Victoria	9	9	9
NSW	4 always, 1 sometimes	3 always, 2 sometimes	5
Australian Capital Territory	3	2 always, 1 sometimes	3
Queensland	4	3 always, 1 sometimes	4
Northern Territory	2	none	2
Western Australia	2 always, 1 sometimes	none	3
South Australia	3	none	3
Tasmania	3	3	3

	<i>Non Occupational Therapists</i>		
	Off-road	On-road	Number of OT's
Victoria	none	1	1
Northern Territory	none	1	1
Western Australia	none	1	
South Australia	brief interview	1	1

In total, 30 assessors (29 occupational therapists and one non occupational therapist) normally complete an off-road assessment, and 28 assessors (24 occupational therapists and four non occupational therapists) normally complete an on-road assessment.

3.3 NATURE OF OFF-ROAD ASSESSMENT

The various standard forms used in different facilities throughout Australia to document assessment information are shown in Appendices 3, 4 and 5. These include forms from the University of Sydney Driving Rehabilitation Education and Research Centre Driving Course, New South Wales, the La Trobe University Driver Rehabilitation and Education Course, Victoria, variations of these forms, and the forms used by the Curtin University Driving Assessment Consultancy, Western Australia.

3.3.1 Initial Assessment Interview

Survey

Content of information obtained in initial interview:	Percentages:		
	Never	Sometimes	Always
(1) Past driving experience	-	5	88
(2) Mobility/Transfer	-	22	71
(3) Medication	2	7	88

Interviews

Note that information about off-road assessments was obtained from 30 of the 36 interviewees; the remaining six performed only on-road assessments.

(1) Past driving experience

Questions in this category relate to:

- * licence details (licence number, expiry date, endorsements, date of initial licence)
- * traffic infringements
- * accident involvement (including bumps on car)
- * type of driving exposure (urban/rural, interstate, drive to work?)
- * type of car; sole driver of car?
- * how learned to drive.

(2) Mobility/Ability to transfer in and out of the vehicle

Assessors not covering this area by questions in the initial interview said that they rely on direct observation of the client, particularly in later stages of the assessment such as the on-road test.

(3) Medication

Questions most commonly relate to the medical condition as seen from the client's viewpoint, and use of specific medications and alcohol.

Assessors who sometimes omit some of the above questions reported that this is because the information is already on file. When a client first presents for a

driving assessment, a referral form should previously have been completed by the referring doctor or agency. This referral form should document information on: licence number, licence status, licence endorsements; amount of driving experience and types of vehicles driven; medical history and medication taken; attitude to the assessment; hearing (if known), vision (if known), physical and cognitive capacities (if known).

At the initial assessment interview, much of the same information may be recorded. There is a need to check details, for example on current medication and alcohol intake, and to obtain any information missing from the referral form. The driving assessor also uses the interview to develop rapport with the client, to determine the client's views and attitudes related to the assessment and to driving in general, including their reasons for wanting to drive. One assessor reported using the initial interview with elderly clients to show an educational video (from the RACV) on issues related to older drivers.

3.3.2 Hearing

<i>Survey</i>			
	<i>Never</i>	<i>Percentages:</i> <i>Sometimes</i>	<i>Always</i>
	10	20	59
<i>Interviews</i>			

Percentages of interviewees who record information about hearing were similar to those found in the survey. Note that "screen" in this case refers simply to questioning the client: there is no measurement of hearing.

3.3.3 Vision

Survey

	<i>Percentages:</i>		
	<i>Never</i>	<i>Sometimes</i>	<i>Always</i>
(1) Visual Acuity - - Snellen Chart	2	15	83
- other	-	2	2
(2) Visual field - Confrontation	5	22	71
- other	-	-	2
(3) Colour vision - Ishihara	32	12	49
- other	-	5	12
(4) Binocular eye movements			
- Saccadic	17	10	61
- other	-	-	10

Interviews

Eight assessors out of the 30 stated that they do not test vision if this had already been done by the referring doctor and either confirmed as normal, or adequate information provided on any abnormalities.

Both OT courses teach that if a possible visual problem is detected during the assessment, the client must be referred to an ophthalmology, an optometrist or, in states other than Victoria, an orthoptist.

Observation of eye condition

The training courses both teach OTs to observe and record comments on eye condition according to the following checklist: redness, corneal scarring, pupil size and shape, use of glasses and lenses, cleanliness of glasses, reports of blurred/double vision, reports of field deficit or flashing lights, any other abnormalities, and head posture when focusing.

Twenty-three of the 30 assessors who complete off-road evaluations document observed condition of the eyes and eyelids; 22 of them also question the client regarding blurred/double and abnormal vision characteristics.

Acuity

Procedure Taught

Both OT courses teach assessors to measure the static acuity of each eye separately (monocular acuity) and of both eyes together (binocular acuity), using a Snellen chart at a distance of either three or six meters, depending on chart size. The NSW course specifies that the Snellen chart should be mounted in a light box. For monocular testing, the Victorian course teaches that one eye is to be occluded by the client's own hand, a semi-circular card or a special occluder; in NSW the occluder is specified. The client is to read the chart beginning at the top letter and moving down the chart, reading lines from left to right with one eye and right to left with the other to minimise learning effects.

Reported Practice

Twenty-four of the 30 assessors who complete off-road evaluations test acuity; the other six said that this was the responsibility of their program's medical officer.

Twenty-two of the 24 use the standard Snellen chart; six of these use it mounted in a light box. Eighteen of them adhered to the specified viewing distance of either three or six meters.

Two assessors, not trained by either course, use a Bausch and Lomb Vision Tester. Nine of the 15 NSW-trained OTs did not use a light box as specified in that course.

Binocular acuity is tested by 15 of the 24 assessors; readings of monocular acuity are obtained by 21 of the 24 assessors. A recent OT in service training course on vision testing and driving, held at a Melbourne driver assessment facility, advocated the omission of monocular testing from the driver assessment procedure, as recommended by a recent report to the Victorian Minister for Transport (VicRoads, 1992). Three assessors have adopted this practice. An outline of the contents of this training course is presented in Appendix 2.

The practice of reading the lines left to right with one eye and right to left with the other is followed by eight assessors, but reported by others to be unnecessary and a source of confusion to some clients.

Performance criteria

There was wide variation in opinions on the maximum allowable number of errors in a line to be accepted as a pass. Four assessors stated that half of the line being read was a pass, two stated a maximum of three errors, seven specified two errors, nine specified one error, and two stated that no errors were acceptable. The Victorian course specifies that a maximum of two errors is acceptable on any line. The NSW course does not specify a performance criterion.

Assessment of Visual Fields: Confrontation Technique

Procedure taught

Confrontation testing of visual fields is used to determine the presence of gross constriction such as tunnel vision or hemianopia. As the peripheral retina has high sensitivity to the detection of movement and low sensitivity to recognition of form, the result of testing fields depends on the task performed and the background against which stimuli are presented. The NSW course recommends that clients with a diagnosis of cerebro-vascular accident or head injury, be referred to a professional in the field of vision.

The procedure taught by both courses is for the assessor to sit facing the client, with knees to one side in order to be close enough. The client is to look directly at the bridge of the assessor's nose with the eye not under test occluded with a patch. Testing is completed monocularly. The recent Victorian in service training on vision testing and driving, mentioned previously, advocated the exclusion of monocular testing.

Presentation of the stimulus should begin out of the client's visual field and move towards the midline in an arc 30cm away from the client's face. The Victorian course teaches that the stimulus is introduced to the horizontal, vertical and oblique meridians. The NSW course teaches that the stimulus is

introduced to the horizontal and oblique meridians only. The recent Victorian in service seminar advocated the introduction of the stimulus to the horizontal and vertical meridians.

The Victorian course recommends use of an intermittently flashing light known as the European Eye Wand as the stimulus object. An alternative stimulus is the assessor's fingers, wiggling intermittently. In the NSW course, assessors are taught to use their fingers, requesting the client to report the number of fingers introduced to the visual field rather than the presence of movement.

Reported practice

Twenty-seven of the 30 assessors who complete off-road evaluations give a test of visual field. Twenty-one of these assessors test monocularly, 6 assessors test binocularly. Five assessors introduce the stimulus as specified by the Victorian course, five assessors as outlined by the recent Victorian in service seminar, 13 as specified by the NSW course, and four test the oblique meridian only.

Seventeen assessors use the technique of wiggling fingers, 8 use a bright object positioned at the tip of a piece of dowel as the stimulus and 2 used the European Eye Wand.

Other tests/procedures found to be in use were:

- Visual Reaction Timer (Gianutsos and Klitner, Cognitive Rehabilitation Series, 1981). This computer program produces stimuli in a number of positions on a computer screen. The client is requested to react as quickly as possible to the introduction of a stimulus. A record is made of time to react and number of stimuli noticed for each quadrant of the screen. The primary objective of the program is to test reaction time to visually presented information, but it also provides information on visual field.

- Informal assessment of ability in a courtyard

- Annette Barton Lighted Board.

Performance criteria

Acceptable visual field limits are specified by individual state or territory licensing authorities.

Colour Vision

Procedure taught

As licensing authorities do not require standard licence holders to have normal colour vision, the Victorian course states that this test is used only if the driver

has licence endorsements. The NSW course specifies use of a test only if the client's condition indicates the possibility of a deficit.

The Victorian course advocates the use of the 'Tests for Colour Blindness' by S. Ishihara (24 plates). The NSW course advocates the use of the 'City University Press Colour Vision Test'.

Reported practice

Sixteen out of a possible thirty assessors completed some form of colour vision testing. Six out of the 15 assessors trained in NSW used the City University Press Colour Test. Eight out of the 12 assessors trained in Victoria used the Ishihara Colour Vision Test. Two assessors not trained by either course use the Bausch and Lomb Visual Tester.

Variance in when to apply the colour vision test was evident, reflecting procedure taught. Four NSW trained assessors report using the City University Press Colour Vision Test sometimes, and two report using it always. Four Victorian trained assessors report using the Ishihara Colour Vision Test always, four use it sometimes. Ten assessors reported that they never complete either test. Four of these stated that they believed the test was not relevant, as a colour vision defect would not cause the client to be an unsafe driver; four stated that this test was the responsibility of the medical officer; two assessors relied on client report only, and two assessors preferred to refer clients to a Vision Assessment Clinic.

Performance criteria

Clients performing poorly on this test are referred to an ophthalmology, optometrist or, for all states except Victoria, an orthoptist.

.c4.Cover test

Procedure taught

The test is designed to assess co-ordination between the eyes. Observation of any eye movement in the uncovered eye implies that a misalignment exists. Should any defect be detected, an ophthalmology, optometrist or, for all states except Victoria, an orthoptist assessment is required.

The assessor is taught by both courses to stand as close as possible to the front of the client and request them to focus on an object positioned in their midline, six metres away. The assessor covers one of the client's eyes and observes movement of the uncovered eye. This is repeated three to four times for each eye.

The NSW course include two additional tests. One is the repetition of the above test using a distance of half a meter. The other requires a pencil torch to be shone into the client's eyes whilst they focus on the light. The assessor observes the symmetry of the lights reflection in the client's eyes.

Reported practice

Twelve of the 30 assessors who conduct off-road evaluations complete this test. Four assessors stated that they do not complete this test, referring their clients to appropriate professionals if they have concerns.

Of these twelve assessors, nine complete the test with an eye patch and three report using an occluder; none uses a pencil torch. Seven of these assessors reported completing the test on each eye as outlined by the NSW course, at half a meter and six meters.

Eight assessors stated that they watch the movement of the uncovered eye; one assessor reported being uncertain of what to look for when testing.

Binocular Eye Movements

Tests for binocular eye movements taught by both courses are those of ocular movements and fixation. The recent Victorian in service seminar did not recommend testing of binocular eye movements. As binocular eye movement tests are completed by a number of assessors the tests, outlined by the courses, are reviewed separately in this section.

Ocular Movements

Procedure taught

The procedure taught by both courses is for the assessor to stand in front of the client holding the stimulus 30 cm away from their eyes. The assessor instructs the client to follow the movement of a pen or torch with both eyes. In Victoria, assessors are trained to move the stimulus smoothly in a 'H' pattern at eye level and to shoulder width. In NSW assessors are trained to move the stimulus through a 30cm width 'HH' pattern.

Assessors are taught to look for smooth eye movements. Should any deficit be detected an ophthalmology, optometrist or, for all states except Victoria, an orthoptist assessment is required.

Reported practice

Twenty of the thirty assessors who complete off-road evaluations complete this test. Fifteen of these assessors use the Victorian 'H' pattern, and two use the NSW 'HH' pattern. Variations of this pattern were also recorded. One assessor

moves the stimulus in a figure of eight at eye level, to shoulder width, and two assessors move the stimulus in a square at eye level and to shoulder width.

Fixation.

Procedure taught

Both courses teach that tests of fixation need only be given if the client's medical condition indicates a possible deficit. The procedure taught by both courses is similar. The assessor is instructed to stand in front of the client holding a stimulus at eye level, at the shoulder edge, 30 cm in front of client. The client is requested to fixate on the stimulus. The assessor introduces a second stimulus at the same level at the opposite shoulder edge. The client is requested to shift their gaze from one stimulus to another as fast and accurately as possible. The second stimulus is introduced in the lateral, superior and inferior positions 30 cms away from the first stimulus and from the client. The stimulus recommended by the Victorian course is a pen or similar object; for the NSW course it is a paddle stick.

Both courses teach that the second stimulus is also re-introduced as an object in midline, simulating near and distant fixation.

Reported practice

Twenty of the thirty assessors who complete off-road evaluations complete this test. Three assessors reported re-introducing the second stimulus in positions simulating the rear vision mirror, dash, and handbrake positions. Thirteen assessors introduce the stimulus in the horizontal plane, ten in the vertical plane, and eight in the plane simulating near and distant fixation.

Two assessors reported using computer tracking tasks set up by their choice reaction timer, rather than the above procedure.

Performance criteria

The client's ability to fixate on and follow the stimulus is observed. Should any deficit be detected, an ophthalmology, optometrist or, for all states except Victoria, an orthoptist assessment is required.

3.3.4 Motor Response Capacity

In assessing physical competence for driving, the courses vary in their recommended conditions for test application. NSW teaches that the tests are only applied when the medical condition indicates a need, or the referral information is inadequate. The Victorian course teaches that all tests must be completed; information from referral sources is just additional information.

Survey

	<i>Percentages:</i>		
	<i>Never</i>	<i>Sometimes</i>	<i>Always</i>
Range of Movement - Trombly, 1990	7	15	61
- other	-	2	22
Strength - Oxford Scale Rating	5	51	39
- other	-	-	22
Muscle Tone - Quick-stretch	5	51	39
- other	-	-	5

Interviews

Range of Movement and Strength

Procedure taught

The assessment procedures taught by both courses begin with an evaluation of the client's ability to complete movements against the resistance of gravity. If problems are detected then further assessment is required.

When testing muscle strength both courses teach that resistance is applied in the opposite direction to which the client is trying to move, and at the distal end of the moving bone. Movements are completed whilst seated and involve the shoulder, elbow, wrist, hand, hip, knee, ankle, neck and trunk. Strength testing is for the neck and trunk.

The courses specify a test based on the standard range of movement and muscle strength tests outlined in Trombly (1990), to assess tasks related to driving. This includes movements required to complete driving and non-driving tasks.

Reported practice

Twenty-seven assessors out of 30 who conduct off-road evaluations complete some form of range of movement and strength assessment.

Out of these 27 assessors, the numbers who complete these movements are:

Shoulder	flexion: 27 abduction: 25	extension: 18 adduction: 20
Elbow	flexion: 26	extension: 27
Forearm	pronation/supination: 19	
Wrist	flexion/extension: 24	
Digit	extension/flexion: 24 pincer/cylindrical grasp: 1	opposition: 7
Hip	flexion: 24	extension: 16
Knee	flexion: 22	extension: 22
Ankle	dorsi/plantar flexion: 23 eversion/inversion: 17	
Trunk	rotation: 22 anterior flexion: 22	lateral flexion: 19
Neck	rotation: 23	lateral flexion: 15

Eighteen assessors use the prescribed handling techniques for resistance; nine do not. Four apply resistance over the muscle-belly proximal to the joint, five apply resistance on or past the distal joint. Five assessors reported use of handling points to minimize contact and stimulation.

Use of the standard rating scale for strength was reported by 23 assessors. Four stated that they do not test the non-functional limb, nine stated they apply the procedures according to the client's condition, and 12 stated they rely on medical notes if the client is undergoing treatment at the facility.

One assessor evaluates the client's ability to use hand controls and to secure and release the seat belt whilst in the car.

.c4.Muscle Tone

Procedure taught

Both courses teach that muscle tone can be assessed through completion of the following passive range of movement tests:

- a) Flexion/extension (and adduction/abduction of hip and shoulder) of
 - Upper limb ;
 - shoulder,
 - elbow
 - wrist and fingers
 - Lower limb;
 - hip,
 - knee
 - ankle and toes.
- b) Lateral flexion, and rotation of trunk.
- c) Flexion, including lateral flexion, and extension of neck.

An additional test of low tone, mentioned in the Victorian course, is the application of a 'quick' stretch.

Tone is recorded as mild, moderate or severe, together with a comment on the possible impact on driving.

Reported practice

Twenty-seven assessors out of 30 who conduct off-road evaluations complete some form of muscle tone assessment.

Twenty-six test passive range of movement for the upper limbs. Other techniques used to determine upper limb tone are quick stretch (two assessors), observation, palpation and questions (four assessors).

Twelve test passive range of movement for the lower limbs, combining this with range of movement and strength testing. A further ten assessors reported testing of the lower limbs. Assessment is by questioning and palpation. One assessor who deals exclusively with clients with a psychiatric illness reported generalizing the results of upper limb testing to the lower limbs, to avoid upsetting clients.

Fourteen assessors stated that testing of tone is only undertaken when the condition indicates; two specified this as being any client with a neurological condition. Three assessors stated that testing of tone is dependent on information obtained from the treating therapist, medical and file notes.

3.3.5 Tactile Localization, Proprioception and Kinesthesia

Survey

	Percentages:		
Sensation Assessment	Never	Sometimes	Always
Tactile location:			
- upper limb	10	17	-
- lower limb	27	29	-
- other	59	39	2
Proprioception:			
- upper limb	2	2	-
- lower limb	27	20	2
- other	63	61	2
Kinaesthesia:			
- upper limb	5	7	-
- lower limb	32	20	-
- other	59	54	2

Interviews

Tactile localization

Procedure taught

Upper limbs

The assessor is taught by both courses to apply pressure with finger tip for approximately one second on the client's hand. The Victorian course teaches that the forearm is also tested. Pressure is to be applied with constant force. An additional test of firm pressure is taught by the NSW course. The client is requested to report where they are touched. The client's vision is occluded throughout the test, which is applied to both hands.

Lower limbs

Both courses recommend that the therapist question clients to determine whether they can detect changes in surfaces, eg. walking from grass to gravel.

Reported practice

Sixteen assessors out of the 30 who conduct off-road evaluations complete some form of tactile localization assessment. Ten stated that testing for sensation is dependent on observed client condition, three on the medical history or file information, three on self report, and two on the amount of referral information specifically on tactile localization.

Upper limbs

Sixteen assessors use the procedure taught, except that the manner in which the client is able to respond varies. Two assessors ask the client to point to the stimulus, eleven ask the client to touch the skin, and three ask the client to verbally report where they were touched. Three assessors allow the client to respond by touching the skin and verbally reporting.

Lower limbs

Four assessors reported completing a tactile localization test on the lower limbs; eight assessors *rely on questioning only, unless medical condition warrants testing.*

Four assessors use a selection of standard tests, outlined by Trombly (1990); four rely on referral information, observation, client self report and the on-road evaluation.

Proprioception (position sense) and Kinaesthesia (movement sense)

Procedure taught

Both courses teach that proprioception and kinesthesia should be tested.

Upper limbs

The assessor occludes the client's vision and then moves the limbs through a minimum of three simulated driving movements.

Upper limb positions/movements:

- holding a steering wheel, and holding the wheel at full turn
- adjusting the rear vision mirror
- changing the gear shift
- use of the indicator
- operating the dash controls by turning knobs.

Lower limb positions/movements:

The position/movements are;

- accelerating
- braking
- releasing the accelerator/brake or clutch.

The courses vary in their testing methods. The Victorian course teaches the procedure described above for the upper limbs, with the moved limb being returned to the floor once test position/movement has been completed, enabling the client to maintain balance. At least two movements have to be completed.

The NSW course teaches the assessor to place two to three large papers/stickers on the floor, representing the brake, accelerator and clutch. Clients practise placing their feet on the papers as in a vehicle, then repeat the task with their eyes closed.

Both courses teach the assessor to use minimal tactile input by holding onto the client's bony prominences. In the Victorian course, when positioning a limb to test proprioception it is moved 10 degrees per second; for kinesthesia, the limb is moved 5 degrees per second. No rate is specified in the NSW course.

Verbalization of the positions and movements are included by both courses as an alternative means of reporting the movement/position.

An additional Victorian test of proprioception entails clients clasping hands behind the back (right with left, and left with the right hand) and above the head, (left hand with right hand). The Victorian course teaches proprioceptive memory testing as an alternative for clients unable to move the free limb.

Reported practice

Twenty-four assessors out of a possible 30 completed some form of proprioception and kinesthesia testing. Ten stated that the extent of testing was dependent on medical condition, or on the amount and quality of other information.

Fifteen assessors reported that they follow procedures as taught. A further four reported the use of another frequently used test (Trombly, 1990). One assessor stated that kinesthesia was not tested as it produced insufficient information.

Five assessors use non-standard combinations of tests, and complete a variation of movements, combining the test with foot patting and other visually occluded tasks completed with the upper limbs.

Thirteen assessors complete a minimum of three movements for each of the upper limbs, and six assessors test a minimum of two movements for each of the lower limbs. Fifteen did not control rate of movement, four stated that their speed was up to 20 degrees per second. Four Victorian-trained assessors attempted to meet the speed requirements and seven maintained minimal contact in handling.

3.3.6 Co-ordination

Survey

	<i>Never</i>	<i>Percentages: Sometimes</i>	<i>Always</i>
Co-ordination - (Trombly, 1990)	-	10	85

Interviews

Procedure taught

Upper Limb

Both the Victorian and NSW courses prescribe finger to nose, wrist tapping, and forearm pronation and supination tests. Procedures are detailed below.

Finger-nose test

The assessor's index finger is held 30cm from the client's nose. The client is then instructed to use an index finger to alternately touch their nose and then the assessor's finger. Assessors trained in the Victorian course then move the finger to various positions, repeating the movement several times, rapidly, with each hand separately.

Rapid pronation/supination

Clients place both hands on their thighs (Victorian course) or on a table (NSW course). They are to rapidly and repeatedly pronate/supinate one hand. The test is repeated with the other hand. In NSW there is an additional test of bilateral pronation-supination.

Wrist tapping

Clients flex one elbow to 90 degrees, and with the other arm, extend their index and middle digits and rapidly and repeatedly tap the volar surface of the flexed arm. This is repeated with arms reversed.

Tests specific to Victorian-trained assessors were rapid opposition and finger to finger co-ordination; procedure details are outlined below.

Rapid opposition of thumb to all fingers

Clients oppose the thumb of one hand to the digits of the same hand, repeating this movement rapidly, several times. The test is performed with each hand separately, and bilaterally.

Finger-finger test

The assessor initially holds both index fingers 30cm apart and 30cm away from the client's nose. The client uses an index finger to alternately touch the assessor's fingers, repeating this rapidly, several times. The assessor's hand contralateral to the client's hand varies its position to increase the demand on co-ordination. The test is repeated with the other hand.

NSW specifies an additional task of grasp and release. Clients rapidly open and close their fingers fully, with each hand separately.

Lower Limb Tests

Both courses specify foot tapping.

Foot tapping

Clients tap a foot repeatedly and rapidly, maintaining the heel on ground. The test is repeated with the other foot.

Foot rotation

This task is specific to the Victorian course. Clients repeatedly rotate a foot rapidly, internally and externally, maintaining the heel on ground. The test is repeated with the other foot.

Impairment of co-ordination may take the form of abnormalities in the rate, range, or force of movement, and timing and organization of complex movements. Lack of co-ordination can present as a number of symptoms: tremor, dysdiadochokinesia, dyssynergia, ataxia. Assessors record observations of intention tremor, under/over shooting, jerky/incomplete movements and wide based gait pattern.

Reported practice

Sixteen assessors out of a possible 30 complete some form of co-ordination testing. The following reasons were given for not testing: time restraints; the organization had delegated this responsibility to another professional; the medical condition did not indicate the need for assessment; or the medical report provided sufficient information to negate assessment.

Those assessors who test co-ordination do so as follows.

Upper Limb

Eighteen assessors complete the finger to nose co-ordination test, seven complete the wrist tapping co-ordination test, and fourteen complete the forearm pronation and supination co-ordination test. Eight of the 14 who complete the forearm pronation and supination co-ordination test complete both separate and bilateral testing.

Tests specific to the Victorian course

The finger to finger test is used by six out of the 12 assessors. Four of these reported moving one hand position.

The rapid opposition test is used by 16 assessors. As only 12 assessors were trained in Victoria, this indicates that four others have adopted this practice. All of the 16 test the left and right hands separately; seven complete it bilaterally.

One assessor uses the VALPAR II work capacity test, commenting that the test enabled observation of grasp and release throughout practical tasks. No assessor completes rapid grasp and release as an evaluation of co-ordination.

Lower Limb

The test of foot tapping is used by the 12 Victorian-trained assessors, nine of whom complete it bilaterally. Nine assessors from the NSW course include the foot patting test described in proprioception as a test for co-ordination.

Variations of the test were reported by five assessors; four request the client to tap their feet alternately, and one requests the client to tap their feet alternately in a forward and abducted plane.

Three Victorian-trained assessors use the foot rotation test, two requesting the client complete the test with each foot separately and two bilaterally.

3.3.7 Balance

Survey

	Percentages:		
	Never	Sometimes	Always
Balance - Static	7	29	59
- Dynamic	2	32	49

Interviews

Procedure taught

The test is specific to the Victorian course. Assessors test dynamic and static balance. In testing dynamic balance the client, informed of the procedure, is displaced to the point of losing balance. Directions of displacement are anterior and posterior, lateral, and oblique. Any loss of balance is documented.

In testing static balance the client is requested to maintain an erect seated position with eyes open. No external side supports are provided. The assessor observes their ability perform this task

Reported practice

Nineteen assessors out of a possible 30 conduct some form of balance testing.

Eighteen assessors use static balance testing; seven test dynamic balance. When completing the static balance test eleven assessors displace to the anterior and posterior, lateral, and oblique angles; five displace anteriorly, posteriorly and laterally, and a further two displace laterally.

When completing the dynamic balance test, four assessors displace to the anterior and posterior, laterally, and oblique, two displace anteriorly, posteriorly and laterally, and one assessor displaces laterally.

Six assessors stated that balance testing is only completed when the condition indicates that it is necessary; one stated that this was only the case for spinal conditions. Three reported using this test only if time allowed. A further four assessors reported no value in assessing balance.

3.3.8 Mobility, Transfers, Endurance, and Pain

Survey

	Never	Percentages:	
		Sometimes	Always
Pain - Rating Scale (0-4)	20	42	39

Interviews

Procedure taught

Both courses teach that mobility, transfers, endurance, and pain can be informally assessed through observations of the client's performance in tasks completed during the off and on-road evaluations.

Reported practice

All assessors who conduct an off-road evaluation complete some form of mobility, transfer, endurance and pain assessment.

Endurance

Nineteen assessors use observations throughout the evaluation and information from the referral to determine endurance levels. Four specified that the on-road evaluation is required before an evaluation of endurance can be given.

Sixteen assessors use questions relating to the effects of heat, time of day, general fitness, and level of mobility to determine endurance. One stated that clients are asked to hold their legs in extension whilst seated; observations are made of changes in control over time.

Pain

Six assessors judge pain levels through observation and questioning, three use a rating scale of 0-5 or 0-10, and one uses the Occupational Therapy Sensation Testing procedure outlined by Trombly(1990). Six assessors stated that testing is dependent on medical condition.

Mobility and Transfers

Thirty assessors always observe the client transfer when entering the vehicle for the on-road evaluation. Twenty-four question how the client transfers into/out of chairs and car seats, and observe the client walking; 12 also ask questions about walking ability on uneven surfaces. Four assessors' observations are guided by information in referral and file notes.

One assessor uses the Functional Independence Measure (FIM) to determine mobility and independence levels.

3.3.9 Reaction Time

Survey

Percentages:

Brake Reaction Test:	<i>Never</i>	<i>Sometimes</i>	<i>Always</i>
- using Complex Reaction Timer	42	24	20
- other	-	5	15

Interviews

Procedure taught

The Complex Reaction Timer, specified by the Victorian course, entails use of a simulated steering wheel, accelerator pedal and brake pedal. Clients are given standardised instructions; there are three practice trials. The steering wheel and pedals are used to respond to lights on the "dashboard". A green light signifies the beginning of the test. Throughout the test, red and amber lights appear, one at a time, at random intervals; there are 15 lights per trial. Times taken to respond to the lights are recorded, and an average score over the three trials is calculated. American norms are provided for the RACV choice reaction timer (a variant of the Complex Reaction Timer).

Performance on the Complex Reaction Timer is to be recorded in both quiet and distracting conditions.

While recognizing its importance, neither course insists on use of this test due to problems with assessors obtaining access to the necessary equipment. The Victorian course suggests that an alternative test may be conducted using an on-road emergency stop.

Reported practice

Fifteen assessors out of the possible 30 conduct some form of reaction time testing.

Four assessors use the Victorian RACV choice reaction tester, three of whom stated that this option was not always possible. Ten assessors stated they were unable to access a choice reaction tester; three stated they were in the process of purchasing one.

Eight assessors reported the use of other testing equipment: three use a choice reaction timer developed at their centre; two use the Bracy computer packages described by Engum and his co-workers (1988, 1989); two use the Gianutsos and Klitner (1988) SOSH computer program, and one of these also uses their REACT program; one assessor uses a card-sorting task for which standard MODAPTS times provide normative data. (MODAPTS is a widely used industrial engineering Pre-determined Motion Time System.)

Assessors' opinions of reaction time testers were that they were useful in identifying ability to learn, behaviour control, information processing with distraction, left-right discrimination, visual inattention or hemispatial neglect, praxis, visuo-spatial perception, physical processing time, cognitive processing time, organization, and ability to follow instructions. Three assessors commented that performance on the choice reaction timer appeared to have no relationship to the client's driving performance.

3.3.10 Cognitive Capacities

Both courses specify the use of a written test of road law knowledge, a slide assessment test, and monitoring of clients' general behaviour throughout the testing of visual and physical capacities. The NSW course includes a second slide assessment focussing particularly on visual perception. However this serves more as a training device than as a formal test; it is not scored.

Survey

	<i>Never</i>	<i>Percentages: Sometimes</i>	<i>Always</i>
Slide Assessment Test	2	12	85
Road Law Written Test	2	10	85

Interviews

Slide Assessment

Procedure taught

The Victorian and NSW courses have both developed a Slide Assessment, using 12 slides depicting traffic situations; questions pertaining to road law and roadcraft are asked.

The slides are to be shown in a semi-darkened room with the projected image at least one metre in width on a white background. The patient is seated approximately three metres from the projected image.

The assessor reads out the question at the same time as introducing the slide to the screen. The patient provides a verbal response which is recorded by the assessor.

In the Victorian course, repetition of questions is allowed, but not alteration of the words. If the patient's response is unclear or ambiguous, the assessor may say "Please explain again." No further help is allowed. In Slide 12 it is permissible to point to the relevant white car. In the NSW course the assessor is able to use the test as a tool to educate, and to explore the knowledge base of the client.

There is no time limit; each slide is left on the screen until the client has finished answering the question. However, Victorian-trained assessors are taught to record the total time taken for the test. Assessors are to note qualitative characteristics of client behaviour, such as regular repetition of instructions, impulsive answers, and more general aspects of behaviour.

Reported practice

Twenty-eight assessors out of the 30 conduct some form of slide assessment.

Eighteen assessors position clients as taught. Six, however, are restricted by the room size.

The particular slides used vary. Nine Victorian-trained assessors use the standard slides, and two use a set of slides recently developed by the Victorian Occupational Therapy Driving Special Interest Group. (The value of this new set of slides is to be investigated formally.) One assessor has converted the slides into photographs so that they can be used in "mobile" driver assessments.

Twelve NSW-trained assessors use the standard slides; two use a combination of the Victorian and NSW sets, and two who were not trained by either course use slides developed in Western Australia. However, assessors using the NSW or Victorian slide sets in other states often adapted them for local use. Thus, four assessors do not use the first three slides of the NSW slides as they were not

applicable to their state. Two assessors stated they used this test only for neurological conditions.

Nineteen assessors reported that they record prompts given, and seven (trained by the NSW course) reported using prompts, provision of information and feedback throughout the test. Two assessors reported a change in testing procedures for clients with English as their second language, or an aphasic condition. Seven assessors do not score the answers because of the prompting and assistance provided.

Eight assessors reported using the standard instructions, but nine change the wording to make it more 'human'.

Formal timing of the test was completed by three assessors, informal timing by five. Five assessors further stated that timing has no value.

Assessors gave a wide range of opinions as to the value of information obtained from this test. Valuable information was reportedly obtained on the client's ability to observe and scan, recall of road craft and road law knowledge, ability to follow instructions, level of insight, ability to learn new information, ability to display appropriate behaviour, impulsivity control and motivation level. The test also enabled assessment of praxis, visuo-spatial perception, right-left discrimination, sequencing, memory judgement, planning, motor planning, problem solving, visual and symbol recognition, attention to detail, concentration, information processing, aphasia, visual fields, contrast vision, hemianopia, neglect, and integration of tasks.

Visual Recognition Slide Test.

Procedure taught

This test is peculiar to the NSW course. It contains eighteen slides of one roundabout with between one and four significant objects shown, for example three people and a bike. The slide is presented for three seconds, after which the client has to report what was shown, and where. Responses are recorded by marking the correct alternative; the answer sheet shows all possible correct responses. The first three slides are used as practice slides. Normative data on errors and total time taken is provided.

Reported practice

Fourteen assessors out of a possible fifteen NSW trained assessors completed the visual recognition slide test; one of these stated that the test was used only when the client's condition indicated possible cognitive dysfunction. One assessor reported not completing the test due to lack of equipment.

Fourteen assessors complete the first three slides as a trial run, and nine record prompts from the fourth slide on. Of the nine assessors to record prompts, one stated that the prompted response is not included in the score. A further four

assessors use the test to provide information and feedback to clients on their performance capacity.

Ten assessors give the standard instructions, but three have changed the procedure to accommodate clients with poor English or aphasia.

Thirteen assessors reported that responses are interpreted so as to mark the master sheet. One assessor reported their observation that should the client score 30 or less then they would invariably fail the first on-road evaluation, and where they scored 43 or more they would obtain a definite pass.

Assessors reported that performance on this test yields information on the following: ability to observe and scan, comprehend visual and verbal information, attend, concentrate, problem solve, plan, self-monitor, and integrate a number of pieces of information, visuo-spatial perception, memory (visual and verbal), information processing, insight, motor planning, object recognition, visual fields, contrast vision and general patterns of behaviour.

Written Road Law and Road Craft

Procedure taught

The client is seated at a table and is given the test sheet and a pen. Both courses have developed tests to include multiple choice, short answer and diagrammatic questions related to road law. (Where the patient has difficulty reading or writing, a note is made regarding this and assistance provided) Standard instructions are provided by each course. The Victorian course procedure does not allow prompts, and the test is to be timed. The NSW course promotes the test as a tool for education and feedback on performance; no timing is required.

Throughout the test the assessor is to note qualitative characteristics of performance, for example, understanding of questions, and concentration/distractability.

Reported practice

Twenty-five assessors out of the 30 completed some form of pen and paper assessment. Four assessors time the test, two formally and two informally. Sixteen assessors document any prompts used, and four of these do not give marks for prompted answers. Six assessors provide immediate feedback throughout the test as taught in the NSW course.

Six assessors read out the standard instructions, three of whom change the wording to make it more 'human'; nineteen change the instructions and questions to accommodate poor English, aphasia, literacy problems, and the elderly. Two assessors report occasional use of an interpreter.

If changes occur to the structure three assessors report that they separate out the multiple choice and diagram questions. If this is done one assessor ensure that the diagram questions are always completed.

One assessor uses the Driver Test (Ten Core Delivery Systems, 1983) instead of the standard Road Law and Road Craft test.

Four assessors stated that test performance did not appear to be correlated with on-road performance. Others stated that the test enabled evaluation of self confidence, road knowledge and road craft, ability to follow instructions, observation, attention, concentration, behaviour control, frustration tolerance, impulsivity, insight, inhibition, rigidity, right-left discrimination, neglect, motor planning, praxis, visuo-spatial perception, information processing, adaptive behaviour, planning, sequencing, problem solving, learning ability, memory, hemianopia, and visual fields.

Additional Cognitive Tests

Additional cognitive tests recorded throughout the interviews were;

- the Cognitive Behavioural Driver Index, (CBDI; Engum et al, 1989). This battery of tests includes a number of computer programs, pen and paper tests, and a choice reaction timer; scores have been shown to predict on-road performance, and normative data are provided.

- Cognitive Rehabilitation Software Series - Visual Reaction Time Test, and Foundations 1, Visual Scanning

- Computer programs by Gianutsos and Klitner (1981); particular programs used to assess cognitive capacity are Koh's cubes, memory programs, word pairs, REACT and SOSH.

- Dangerous Situations Test, developed by the Victorian Occupational Therapy Driving Special Interest Group.

- Cognitive test battery of the Curtin University Driver Assessment Clinic, Western Australia. This battery includes a selection of tests from the Rivermead perceptual battery, Trail Maker A and B, computer tasks, the King Devick Test, Money's directional task test and the Road Map direction task test.

- Simultaneous visual stimulation. The procedure follows the guidelines for binocular visual field testing; however the stimuli, moving fingers, are introduced from both the left and right.

3. 4 NATURE OF ON-ROAD ASSESSMENT

Survey and Interviews

	Percentages:				
	Yes		No		Sometimes
	Survey	Interview	Survey	Interview	Survey
Use a set route	66	38	34	62	-
Use a standard form to record observations	88	76	10	-	-
Driving instructor involved	93	100	7	-	-

Number of set routes used:

	Survey	Percentages Interview
0	-	62
1	10	19
2	12	19
3	24	-
4	12	-
5 or more	7	-

Survey

Percentage of Assessors Reporting Route(s) were developed:

by self	55%
with driving instructor	81%
from OT course guidelines	58%
from client-specific details	42%
by other OT	32%
using licence testing route	19%
by driving instructor	10%

When either no set route or more than one set route is used, choice of route on a particular occasion is determined by:

	Percentages
client ability	78
time of day	42
random selection	7

3.4.1 Areas documented in the on-road evaluation.

<i>Percentages of Assessors Reporting the area as being</i>	<i>documented or</i>	<i>critical to document</i>
Mirror observations	95	71
Brake/clutch use	93	45
Lane position	98	63
Indication	93	61
Compliance with road law	95	82
Gap selection	71	47
Speed control	98	71
Right and left turns	93	40
Steering	98	61
Passing and being passed	76	34
Engine control	59	16
Concentration	95	92
Perception	93	82
Comprehension of information	88	55
Memory	90	66
Planning and judgement	95	92
Behaviour (e.g. anxiety, confidence, aggression, etc.)	95	79

Interviews

Procedure taught

Both courses specify that the on-road evaluation requires a qualified driving instructor with dual control vehicle, and that the assessor should record driver performance from the rear passenger seat. Throughout the drive, observations are to be documented on standard report forms. Assessor trained by both courses are required to document performance related to vehicle handling, bad driving habits, anxiety and behavioural control, and physical and cognitive abilities.

The Victoria course form requires a set route to be developed by each assessor, and details instructions to be given at specified intersections. It includes sections to document the client's performance in observation; brake, accelerator and clutch use; indicator application; lane position; and compliance with the law.

The NSW course teaches similar strategies for route development; there should be a range of driving situations. However, use of set routes is not required. Rather, it simply recommends that the assessor has general areas designated as nursery, moderate, and heavy. The on-road report form is therefore necessarily open in format, with no specific instructions.

Reported practice

Twenty-six assessors out of a possible thirty-four conduct an on-road assessment.

Documentation of client performance is completed on a formal report form by twenty assessors, three of whom use the 1987 Victorian course form (see Appendix 5).

Ten assessors use a set route. Of these ten, five have more than two set routes. The remaining sixteen assessors do not have a set route. Of these, five prefer to have areas designated as nursery, moderate or complex, and eleven prefer to "design" the route as they drive. All twenty-six assessors complete the on-road assessment with a driving instructor responsible for vehicle control.

Time taken to complete the route varied. Twenty assessors reported a time of 30-45 minutes; three reported 0-30 minutes, and three reported 45-60 minutes.

All 26 reported that they begin their on-road test in a quiet environment, progressing onto wide streets; the route includes strip shopping centres, roundabouts, traffic lights and signs. Twenty-five assessors included road hazards (e.g. road works), traffic management systems, and twenty-two assessors included parking either in the street, in underground car parks or strip shopping centres.

There is less consistent incorporation of the following route characteristics: freeway or four-lane roads (8 assessors), emergency on-road stops (6), and navigational tasks (3). Seventeen assessors use the technique of two step instructions to clients, to assess short-term memory capacity under stress. The technique of commentary driving was used by one assessor.

Ten assessors mentioned inclusion of conditions to assess four wheel driving, bush and dirt track driving and use of heavy vehicles; seven of these assessors incorporated such conditions in their normal route.

Assessors reported obtaining information from the on-road test on the following client characteristics: ability to apply road knowledge/craft, ability to physically handle the vehicle and on necessary vehicle adaptations, ability to maintain balance, to mentally and physically endure the drive, to accommodate pain, to accommodate visual defects such as hemianopia and neglect, to integrate the various driving sub-tasks, to monitor their own behaviour and modify it appropriately, to visually attend to multiple stimuli, to sustain attention, to recognize objects, to react to unexpected situations, to maintain lane position, to anticipate and plan actions, to process information, to judge distance, accommodate driving habits, to follow instructions, and to problem solve.

3.5 SUMMARY OF CURRENT AUSTRALIAN PRACTICE.

There is variation between and within assessors in the particular tests chosen for use in a given assessment. Variation may be related to the assessor's original training course, the client's medical condition, and the amount and nature of referral information. Assessors trained in Victoria are more likely to complete all tests specified, compared to assessors trained in New South Wales, reflecting differences between Victorian and NSW training courses. There is a general tendency for the non-testing of capacities likely to be unaffected by the diagnosed disability; this is particularly strong among NSW-trained assessors.

3.5.1. Components of the Off-road Assessment.

The initial interview

Questions are asked regarding licence details, history of licence conditions and infringements, medication, alcohol intake and hearing ability. Procedures are followed consistently in this component of the assessment. Eight-eight percent of assessors in the mail survey and 97% of assessors interviewed reported asking these questions.

Visual capacity

Aspects of vision checked are eye condition, static acuity, visual field, fixation, eye movements, colour and cover test. The most frequently used tests are of visual fields and acuity. Particular procedures and performance criteria used in testing these capacities vary considerably.

Tactile localization, proprioception and kinesthesia

Testing of these capacities is highly variable. The decision to test or not was commonly based on client diagnosis. There is also considerable variation in test procedures.

Motor response capacity

Aspects of response capacity checked are range of movement, strength, and tone, the first two most commonly. The selection of component tests is commonly dependent on the diagnosed disability. When testing strength, the majority of assessors use the prescribed handling techniques for resistance, and apply standard performance criteria.

Co-ordination testing

Most commonly used are the finger-nose, and rapid opposition tests. Procedures in applying these tests vary.

Balance testing

Results for the testing of balance are similar to those for co-ordination.

Mobility, transfers, endurance, and pain

Informal observations of mobility, transfers and endurance were the most common basis for assessment. Both the decision to test, and methods of testing, are highly dependent on the diagnosis.

Reaction time

Only 50% of assessors interviewed use some form of choice reaction time assessment. This low level was primarily because of lack of access to suitable equipment.

Cognitive capacities

Level of use of the slide, visual recognition and pen-and-paper tests was high. Administration procedures varied in terms of use of prompts, use of standard instructions, timing, and length of presentation of each slide.

A number of additional tests are in use.

3.5.2. The On-road Assessment

Seventy-two percent of interviewed assessors reported that they use on-road tests. Assessors differ in the nature and manner of information recorded, their use of set driving routes and the duration of the test. The most frequently documented 'crucial' aspects of driver performance relate to the driver's planning and judgement, perception, concentration, speed control, compliance with the law, mirror observations and general behaviour. No standard performance criteria are used, the pass/fail decision being determined ultimately by a subjective opinion.

3.6 ADDITIONAL SOURCES OF INFORMATION

Additional information may be sought by assessors either before or after the off-road assessment of a driver with a disability. Other sources of information include a specialist report or reports from family. Where the diagnosis suggests that additional information is required, for example when there is a history of epileptic seizures and the condition is unstable, a report may be sought before the initial off-road assessment. When the impetus for obtaining additional information comes from the off-road assessment itself, it is recommended that the on-road assessment is not completed until the information is provided. This is particularly important when the issue relates to medical fitness to drive, for example, visual defects, or epilepsy.

Assessors were asked what additional sources of information they used, and their reasons in each case. Responses are summarised below.

Neuropsychologist: Neuropsychologists are referred to as a result of the off-road assessment and, in some facilities, as a precursor to the referral. Information is obtained regarding cognitive ability, information processing, attention, judgement and memory. The reported value of such reports varied somewhat: two assessors commented that the outcome score (in terms of normative data) provided by their neuropsychologist is useful; some used the reports to confirm their findings from the off-road assessment; others found the reports to be of little use.

Ophthalmologist/Optometrists: Ophthalmologists and optometrists are referred to as a result of both the referral information and the off-road assessment. Reports from these specialists provide precise information on visual ability, tracking, depth perception, scanning, and peripheral field vision.

Speech Pathologist: Speech pathologists may be referred to if the client has previously been seen by them. They provide to clarify speech and comprehension capacity, verbal information processing ability and literacy skills.

Physiotherapist: Physiotherapists are referred to in comparable circumstances to speech therapists. Information from physiotherapists is useful in clarifying physical status. It was mentioned by two assessors.

Audiologist: These professionals are referred to both as a result of the referral information and the off-road assessment. The information obtained is a greater understanding of hearing deficits.

Therapists/case workers: These are referred to both as a result of the referral information and the off-road assessment. The information obtained is related to successful modifications and treatments. This group was also referred to

after the assessment was complete in order to establish other forms of transport, if required.

Doctor/medical officer: The doctor and or medical specialist are used prior to the assessment process, to obtain a medical clearance and to obtain information regarding diagnostic outcomes and information on condition ie seizures. This group is also referred to after the off-road assessment to obtain referrals to other specialists.

Psychiatrist: These are used prior to the assessment process to obtain a medical clearance and to obtain information regarding diagnostic outcomes, length/pattern of illness, compliance with medication and side effects of medication. They are also referred to after the off-road assessment if the assessor is concerned about the medical status of the client.

Neurosurgeon/Neurologist : These are used prior to the assessment process to obtain a medical clearance and to obtain information regarding diagnostic outcomes and information on condition.

Family: The client's family are used prior to the assessment process to obtain information on past and present capacities. Information is also obtained on the family dynamics surrounding the referral.

Where the assessor is not an OT, information is obtained from the referrer prior to the on-road assessment, as no off-road assessment is completed. Referees include therapists and doctors.

3.7 LICENCE AUTHORITY POLICY AND PROCEDURES.

3.7.1. Identification

Drivers with disabilities are usually identified in one of the following situations:

- at licence renewal
- following recovery from an illness and/or rehabilitation in a hospital setting
- from police accident reports
- by a concerned member of the public.
- self disclosure.

No legal requirement exists in New South Wales, Australian Capital Territory, Queensland, Northern Territory, Tasmania, Western Australia or Victoria for anyone to report people with driving-related disabilities to the licensing authority. The only exception to this is in South Australia where doctors are legally required to report such people.

Following recovery from an illness and/or rehabilitation in a hospital setting, procedures differ between states in terms of who is legally authorised to report the condition. In Victoria, NSW, Tasmania and South Australia a medical certificate may be issued by the treating doctor; however in Queensland and the ACT, only a Commonwealth Medical Officer (CMO) is authorised to report to the licensing authority. In the Northern Territory, a Medical Testing Officer (MTO), appointed by the registrar of Motor Vehicles is authorized to provide an assessment when requested.

Procedures to deal with information from members of the public vary. In South Australia, NSW and Western Australia a signed report of the complainant's concern is required. In NSW, an interview is used to confirm this report. In the Northern Territory, Victoria, the ACT, Tasmania and Queensland, consideration is also given to verbal information and to less formal written reports.

3.7.2. Medical Reports

Medical reporting is governed by individual state/territory guidelines, or by the National Guidelines for Medical Practitioners. Once a driver has been identified to the appropriate licensing authority as having a relevant medical condition, a medical clearance is requested. The form of medical report differs between states. All forms include the same personal information; however, they differ in their level of detail in questions related to medical condition. Levels of specified minimum performance vary between states.

Once medical clearance is given, all states and territories require an assessment of on-road performance, unless an exemption is granted based on a doctor's

recommendation, or an assessment may be deemed unnecessary if the disability is minor.

.c3.3.7.3. Sources of Specialist Information

The following categories of professionals may be requested to provide a report on a driver's disability.

Ophthalmologist/Optometrlist/Orthoptist
Psychiatrist
Neuropsychologist/Psychologist
Neurologist/Neurosurgeon/or Specialist Physician
Physiotherapist
Occupational Therapist
Driving Instructors with specialized training.

However, the only professionals legally authorised to report to the licensing authority are as follows.

General Medical Practitioner	WA SA NSW ACT QLD TAS VIC
Ophthalmologist	WA SA NSW ACT QLD TAS VIC
Optometrist	NSW VIC
Orthoptist	VIC*
Psychiatrist	WA SA NSW ACT QLD TAS VIC
Neurologist/Neurosurgeon	WA SA NSW ACT QLD TAS VIC*
Physiotherapist	WA SA NSW ACT QLD TAS
Occupational Therapist	VIC

*In Victoria, amendments to the current legislation are proposed to enable official reports to be sought from orthoptists and psychologists. At present neurologists, neurosurgeons and other physicians are included as specialist physicians.

In the Northern Territory, only MTOs are authorised to submit formal reports upon request/referral by the Registrar of Motor Vehicles. The Registrar may refer patients to any of the above practitioners or accept any unsolicited report and use this to decide whether the person should drive with an open or conditional licence.

Exceptions to the above exist in practice. In South Australia, Western Australia, Queensland and the ACT, occupational therapist reports are accepted if included in a medical report. However, in Tasmania, Western Australia, South Australia, NSW, and the ACT, licensing authorities commented that occupational therapist reports, summarizing their evaluation and related factors, was of great use in deciding the final recommendation for driver with disabilities. This was particularly noted for the following conditions, all of which are likely to entail significant cognitive impairment: cerebral vascular accident, head injury, progressive neurological conditions and disabilities related to old age. In Western Australia the licensing authorities have established monthly meetings

with an occupational therapist assessors and the associated driving school in order to obtain information on current cases; that is, to decide whether or not particular drivers with disabilities should be given a licensing authority on-road test.

3.7.4 . On-road Testing by Licensing Authorities

Once specialist reports and medical clearance have been obtained, the usual practice is for the client to undergo a practical driving test, given by licence authority testers in all states/territory, except sometimes in Victoria. In Victoria an on-road test by an occupational therapist is acceptable in lieu of a licensing authority on-road test in the case of licensed drivers with disabilities.

NSW has specially trained 'Disability Driver Testing Officers'; these are licence testing officers who have undergone a course with Sydney University's Driving Education Rehabilitation and Research Clinic.

The ACT has three specialist licence testing officers who have completed the seven day Driver Education Centre of Australia's course in defensive driving for the disabled.

South Australia, Western Australia, Queensland and Tasmania use standard licence testing officers, informally selected to possess appropriate interpersonal skills.

Victoria uses occupational therapists with two years graduate experience and a Driving Assessment and Rehabilitation Course. However, OTs do not assess all drivers with disabilities. They are most likely to assess drivers whose disabilities have brought them within a hospital with a specialist rehabilitation facility, and people referred by community rehabilitation agencies. VicRoads may also refer drivers reported to them.

In Darwin, a nurse/driving instructor with training (at a rehabilitation facility in the United Kingdom) is used to evaluate driver performance. In other areas of the Northern Territory, the Department of Health and Community Services advise the appropriate authorities/Motor Registry on how and what to test.

3.7.5 Specific Disability Testing by the Licensing Authorities.

In the case of drivers with a progressive neurological disorder, the ACT has a policy of yearly assessment.

Older drivers:

The other major category of 'disability' for which special provisions are those associated with old age. Below is a tabulation of state/territory policy on the minimum age defining "older" drivers, the frequency of driver performance checks, medical certificate requirements, vision reports and on-road practical test, for drivers with a private motor vehicle licence.

State	Minimum age defining "older" drivers	Frequency of driver performance checks	Medical certificate	Vision reports test	On-road practical
Australian Capital Territory	70+	annually	YES	YES	
Tasmania	75+	annually	YES	YES	YES
NSW	85+	annually	YES	YES	YES
Victoria	The restriction applies only for commercial passenger vehicle licences.				
Northern Territory	None applicable	The case under review determines the frequency	Not required for 'aged' drivers	Every six years for all drivers	Not for 'aged' drivers
QLD	70	annually	YES	YES	If requested
Western Australia	75-80	If requested	If the medical condition indicates a need.	YES	If requested
	80	annually	YES	YES	
South Australia	70+	annually	Depends on the case information	Is included in the Medical certificate	When requested

3.7.6. Testing Procedures

Testing procedures used by licensing authorities for assessing drivers with disabilities are the same as those used for normal driver licence testing. Thus, procedures vary between states/territories; it is beyond the scope of the present report to document details of these standard procedures.

3.7.7. Licence Conditions, including Vehicle Modifications

Licence conditions range from the requirement that a driver wear vision correction lenses, to the requirement to drive only in a modified vehicle and/or only with a driving instructor.

In some states (Western Australia, ACT and Queensland), drivers assessed as requiring special licence conditions must immediately surrender their existing driver licence and apply for a conditional or learner licence. Licence conditions may also be imposed as a result of an on-road test.

Following an on-road test in the ACT, South Australia, Queensland, Northern Territory, NSW and Victoria, licence conditions may be imposed concerning vehicle modifications and driving conditions (restrictions on areas in which driving is allowed, time of day and number of people in the vehicle).

In Tasmania, driver licences are not made conditional on vehicle modifications; rather, the required modification is recorded on the vehicle's registration.

If there is an inconsistency between different special assessment reports presented to the licensing authority, or if the authority's decision is appealed, the issue is dealt with as follows:

Victoria: Medical Review Board, the Magistrate's Court, or VicRoads.

ACT: Medical Review Board

Northern Territory: through the Magistrate's Court.

Other states: dealt with by the authority itself.

3.7.8. Inspection of Vehicle Modifications

Inspections of vehicle modifications, using the ADR standards as a guide, are conducted by the licensing authorities in all states except Victoria and NSW. In Northern Territory the inspection is carried out by the Motor Registry's Vehicle Standards Section in conjunction with a driver licensing officer.

In Tasmania and the ACT a photo of the modification is placed on the driver's file, and in Tasmania the driver must submit for re-test in their modified vehicle. In Western Australia a permit for the modifications is issued and a copy kept on file.

In the ACT and Victoria difficult and complex cases are referred to a medical board comprising medical and other specialists appropriate to the particular case.

All forms collected from the interviews, and the VicRoads draft recommendations to the Minister of Transport from the Functionally Impaired Drivers Working Party (1992) are provided in the Appendices 6 and 7.

3.8 FUTURE DEVELOPMENTS AS SEEN BY THE LICENCE AUTHORITIES AND DRIVER ASSESSORS

Interviewees were asked to elaborate on what they perceived were necessary developments to establish a more effective and efficient system of assessing disabled drivers. The main themes of responses were increased community and professional awareness, the development of resources and formalization of the policies and procedures.

3.8.1. Community and professional awareness.

An increase in the public's awareness of the issues associated with disabilities and driving was considered essential by both the assessors and the licence authorities. Education to achieve this was considered particularly important for agencies dealing with people who have disabilities, particularly those dealing with psychiatric illness. Agencies mentioned in this context by assessors were community workers, acute hospital therapists, rehabilitation specialists, outside agencies such as private occupational health centres, and driving schools.

Commonly mentioned problems which education should address both for the general public and agencies dealing with disability, were the need to dispel the perception that driver evaluation is an act of discrimination, and the impact disabilities may have on driving. In addition, licensing authorities referred to a need to educate people to understand that driving is not a necessary right of any person over the age of eighteen.

Concern was expressed by both assessors and licensing authorities regarding referral of cases from the medical profession. Where doctors are aware of the facilities, the process, and the need to refer, assessors reported that referrals were adequate in frequency and information content. However, it was felt that this applies only to a small number of doctors. Hence, concern was expressed about the large number of doctors who are unfamiliar with or unaware of the need for special assessment processes and/or facilities.

Both groups proposed that education should target the medical profession's understanding of how a disability may impact on driving, their role in the assessment process and possible interventions which may enable people to maintain, resume or begin driving. This concern was reflected in the number of interviewees - approximately one third of the assessors and all licence authorities - who requested an information seminar for doctors.

3.8.2. The development of resources

To meet the expected higher level of future need for specialist driving assessments, assessors from Tasmania, Western Australia, South Australia, Northern Territory and ACT suggested an increase in the number of OT driver assessors. Areas outside metropolitan regions, particularly in the Northern Territory, were mentioned by both the licence authorities and assessors as being in particular need of increased access to OT assessors, to driving instructors

aware of the special needs of the impaired driver, to modified vehicles, and to vehicle engineers. Assessors also identified a need for counselling services for clients unsuccessful in maintaining or obtaining their licence.

South Australian and Western Australian licensing authorities suggested the development of a formal liaison process between themselves and professional resource people, such as occupational therapists, medical personnel, engineers, and where the case involved an appeal, a medical appeal or advice board should be constituted.

Two common complaints from assessors, not particular to any region, emerged from the interviews. One was the current low level of referral of clients with Cerebral Palsy, psychiatric illness, dementia and Huntingdon's disease, all of which commonly have cognitive impairment inherent in the disorder. The other common complaint concerned the need to develop alternative means of transport for clients unsuccessful in maintaining, or obtaining their licence.

3.8.3. Formalization of the policies and procedures.

Two thirds of the assessors and all licence authorities identified a need for standard tests and procedures, both for off-road and on-road assessments. Both groups of interviewees elaborated on the need to include guidelines for specific medical conditions, standard route development guidelines and a standard method of systematically and objectively recording on-road observations. The assessors also suggested establishment of appropriate test norms to enable more meaningful interpretation of scores, and the provision of information pertaining to the correlation between off and on-road assessment. Licensing authorities also commented on the need to develop national vision standards. In Victoria, OT driving assessors are in the process of standardizing the criteria for test routes, and investigations are being made on the implementation of the 'Vehicle On-Road Test' (VORT) system of recording observations. The VORT is an adapted version of the CORT test, recently trialed in Victoria (Fabre et al, 1988). An OT assessor in NSW has applied the NSW licensing authority's version of the CORT to her route. The name of this system is DART.

A need for a formal system to maintain proper standards of professional assessment practice, and proper standards of vehicle adaptations, was commonly mentioned by assessors. It was suggested that all assessors rejoining the field, or those trained for greater than five years, should complete a refresher course run by the profession. Both groups of assessors were seen to require frequent quality assurance seminars.

A need was also identified to develop standards for vehicle modifications and adapted equipment. It was suggested that these standards should include welding standards, vehicle modification inspections and reviews by the licensing authorities, and a review of rules regarding driving from a wheelchair.

Another concern was policy relating to reporting of medical cases to the licence authority where conflicts between professional ethics involving confidentiality, and associated professional indemnity, and the need to report potentially unsafe drivers. Eleven assessors reported not being legally able to inform or send reports to the licensing authority due to client confidentiality, and to not being included in legislation as an authorized assessor. This problem was also recognised by the licence authorities and mentioned in relation to the reporting of cases by doctors. Client confidentiality affects the reporting of information when a worker within a hospital setting becomes aware of a client whose condition may impact on driving, but the client does not consent to the release of information. In this situation no information can be forwarded to the licensing authority and no action can be taken by the staff member. Where the OT is not recognised as an authorized assessor, the OT reports are not able to be formally accepted by the licence authority. However in practice the licence authorities reported that they recognised and acknowledged the OT driving reports and recommendations.

Eighteen assessors and all licence authorities commented on the inadequacy of guidelines pertaining to the action necessary for a given condition, ie. when and how often an assessment is required. Noted particularly by the assessors was the process for reviewing neurological conditions, particularly when progressive. Assessors and licence authorities suggested that more comprehensive guidelines should be developed, detailing the impact on driving of a condition and recommended actions in each case. Assessors requested that the guidelines should be developed on the basis of symptoms rather than diagnostic category. Along with the issue of guidelines, the licence authorities expressed concern over the inadequacy of the National Guidelines for Medical Practitioners. The licence authorities recognised the need and suggested the development of a more comprehensive and detailed version.

Connected with the issue of guidelines was the need to clarify and eradicate some current loopholes in referral, in evaluation, and in re-assessment. A case requiring clarification is that of a person with a psychiatric condition wishing to obtain a learner's permit. In Victoria, this learner is unable to get a learner's permit without an OT report; however, an OT's report requires a learner's permit. Assessors also requested further clarification of the policies relating to licence status of individuals under assessment. Cases were cited by assessors wherein some people were required to submit their licences and were issued learners permits or temporary licences and some were not. This was particularly likely to occur when the person required driving lessons.

Variation exists between states and territories, and the amount of communication the department had had with disability policy and procedures. It was for these reasons that comprehensive policies were requested by assessors and that an effective strategy for communicating the information to the regional offices be developed.

Another common loop hole that was cited by the assessors was the problem of contradictory assessment outcomes. This concern was mainly centred around

the issue of a driver with a disability who unsuccessfully completes an OT driver assessment and then goes on to successfully complete a licence authority test. Both specialist assessors and licensing authority assessing staff believed that such occurrences arise because of the inability of normal licence tests to identify the effects of cognitive disabilities particularly those affecting endurance. Such inconsistencies were said to encourage some drivers to 'shop around' until they obtain a positive result. Apart from the intrinsic limitations of the standard licence test inconsistencies between different forms of test may also arise due to pass and fail criteria. Many assessors commented on the need for normative data for on-road tests to provide a more valid basis for pass/fail decisions.

In Queensland, ACT, NSW, Tasmania and Victoria the licence authorities requested a change from the current very general wording of questions related to the medical condition on licence renewal forms, to more specific wording mentioning particular disabilities. It was felt that this may improve current reporting levels. At present the question did not account for the person without insight into their disability, or the desire to inform the authorities.

Concern was expressed with the current means by which drivers with disabilities come to the notice of licensing authorities. When the interval between licence renewals is long (for example 10 years in Victoria), a driver who acquires a disability or condition that may impact on driving may continue to drive for many years with no legal obligation to inform the authorities.

Both licence authorities and assessors identified a need to formalize the occupational therapist role. As mentioned previously the OT assessments were seen as making a unique and essential contribution to the assessment of disabled drivers. It is therefore of concern that OTs are not included in the Acts as authorised assessors in any state other than Victoria; their reports can only be submitted informally, or through the medical reports.

There was felt to be a need for some form of financial assistance to disabled drivers not covered by any insurance scheme, in order to pay for the assessment, remediation lessons, and any vehicle adaptations.

3.8.4. Areas requiring further research or development

Areas identified by assessors are outlined below. (Their own terminology is retained; however it can be seen that many of the areas identified relate to the need for information to establish the criterion and predictive validity of tests used in assessment.)

- Establishment of outcome measures for the visual screen.
- Development of standard and objective assessment tools for the physical assessment.
- Development of a specific battery to identify the impact a neurological impairment may have on driving. This battery was to include outcome measures and guidelines related to procedure. Components mentioned as in

need of development were related to perceptual functioning, motor planning, problem solving, information processing and attention.

- Development and standardization of the instructions and wording for the OT slide assessments.
- Development of outcome measures for the slide tests and the written road law test.
- The validity and the predictability of the Choice Brake Reaction Timer on a range of physically and cognitively impaired persons.
- Development of norms for assessment tools.
- Development and assessment of the value of remediation strategies for a number of conditions.
- Longitudinal studies into cost, risk and effectiveness of assessments.
- Development of test batteries that are directly transferable to other states or to the territories.

Research topics identified by the licence authorities are outlined below.

- Guidelines for assessment of disabilities.
- Validity of the licence authorities 20-25 minute on-road test for people with disabilities.
- Test re-test and inter-rater reliability for recording on-road driving performance with people who have disabilities.
- The cost effectiveness and validity of establishing a specialized driving assessment centre for drivers with disabilities. The specialized assessment process was stated as including the OT, driving instructor and client.

4. SUMMARY AND EVALUATION OF CURRENT AUSTRALIAN PRACTICE IN THE ASSESSMENT OF DRIVERS WITH DISABILITIES

4.1 INTRODUCTION

Current Australian practice is considered within the framework outlined in section 1.3, according to the criteria of validity and reliability established in section 2.

Given the difficulties of demonstrating predictive validity of driver assessment procedures in terms of subsequent crash rates, it is important that the assessment has construct validity. To achieve this, the system should incorporate tests of a comprehensive range of basic capacities and higher-order components of driving skill, as well as an assessment of on-road performance when appropriate. Also, to enable the valid and equitable interpretation of test results it is essential that normative data be able for all components of the assessment system.

The current Australian assessment system is evaluated below in terms of the above framework: components of the current system are discussed separately for operational, tactical and strategic levels of behaviour.

4.2 ASSESSMENT OF OPERATIONAL BEHAVIOUR: *basic sensory, cognitive and motor capacities and skills*

4.2.1 *Basic Capacities*

Current Australian practice places heavy emphasis on the off-road assessment of basic sensory and motor capacities. In contrast, basic cognitive capacities are given relatively little attention.

Sensory capacities assessed are various aspects of vision (static monocular and binocular acuity, and visual field), touch, proprioception, kinesthesia and hearing. Motor capacities assessed are various aspects of co-ordination, balance, and response time (half the assessors).

Some Australian assessors do not formally test any basic cognitive capacities, due to the lack of appropriate test equipment. The official procedures recommend inclusion of a choice response task (or "brake reaction time" test) as part of the off-road assessment battery. Although generally regarded by Australian assessors as a test of motor response time, in fact such tests have a cognitive element to the extent that they entail response to more than one stimulus and/or selection between more than one response alternative as part of the task; the greater the number of stimulus or response alternatives, the greater the cognitive element in this task. However, choice response time is an index of only one type of basic cognitive capacity, and is only one of many different types of cognitive tests which are included in some other off-road assessment batteries, such as that

developed by Engum and co-workers (Engum *et al*, 1988; Engum and Lambert, 1990).

Most Australian assessors are aware of the importance of cognitive capacities related to attention allocation: ability to allocate attention appropriately between concurrent sub-tasks, to attend to events in the correct sequence, to resist distraction, and to sustain attention for reasonable periods of time. While objective tests of such capacities are not part of current Australian assessment practice, assessors often reported that they use informal strategies developed in an attempt to evaluate performance in these areas.

4.2.2 Basic Skills

Sensory and motor driving skills at the operational level are not specifically assessed by Australian assessors, either off-road or on-road, except in so far as they form the basis of on-road driving performance. In some other assessment systems, computer-based tracking tasks or off-road driving tasks are used to test perceptual-cognitive-motor skills at the operational level.

In Australia, some learned 'mental models' of traffic system operation which constitute basic cognitive skills, are assessed by a Slide Test, a written Road Law test, and for NSW-trained occupational therapists, a Visual Recognition Slide Test. All of these tests demand interpretation of various traffic situations in terms of knowledge and understanding of traffic system operation. The form of these tests imposes little or no time pressure, which minimises their value as measures of operational skills. Nevertheless, elements of operational cognitive skills probably influence performance of these tests.

Other basic skills such visual scanning, gear-changing, braking, and perceptual-motor skills underlying the routine maintenance of vehicle speed, lateral position and following distance are not separately assessed. Judgements about them are made only on the basis of the on-road assessment.

4.3 ASSESSMENT OF TACTICAL BEHAVIOUR: *sensory/ perceptual, cognitive and response skills and behaviour*

Driving behaviour at the tactical level usually incorporates components of all three stages of information-processing. At the tactical level this behaviour can only be assessed in traffic (or by use of a highly sophisticated, interactive simulator). In Australia, the processes of responding to various traffic situations and events by adjusting vehicle speed, adjusting lateral position and/or adjusting following distance, patterns of eye movements and rear-vision mirror use, are examples of tactical behaviour which are evaluated on-road.

Tactical behaviour which is predominantly cognitive in nature, such as varying patterns of attention allocation (e.g. to traffic signs or to pedestrians), and decisions concerning right of way, or related to responses to various traffic events, can be tested with varying degrees of sophistication and validity using

slide, video or computer presentations of traffic situations. As mentioned in the previous section, a Slide Test (two in the case of NSW-trained assessors), and a Road Law Test are used for this purpose in Australia.

By comparison with other assessment systems, the Australian system places little importance on the assessment of basic cognitive capacities or cognitive skills at the operational level, and relatively a great importance on the assessment of cognitive assessment at the strategic level.

4.4 ASSESSMENT OF STRATEGIC BEHAVIOUR: *cognitive behaviour*

Behaviour at this level is not generally observable during on-road testing, since it consists of decisions normally made prior to commencing the drive, such as choice of when and where to drive, and under what environmental and personal conditions.

In the current Australian assessment system there is no formal means of assessing such behaviour, but many assessors are aware of its importance in the context of their clients' awareness of and insight into the effects of their own disabilities. Thus, during the initial interview, and informally throughout the assessment, they attempt to determine attitudes related to such factors.

4.5 RELIABILITY OF CURRENT ASSESSMENT PROCEDURES

As discussed in section 2, reliable on-road test procedures are characterised by use of a standard, pre-determined route and a closely-defined scoring procedure entailing evaluation of pre-determined aspects of behaviour at pre-determined points along the route. The current Victorian training course teaches assessors to use such a method; the NSW course currently does not, but there are plans to change to this method. Current levels of use of set routes, and of standard observational and scoring procedures, are not high.

Similar principles apply in application of the off-road tests: procedures and scoring criteria need to be clearly defined. In fact, considerable variation was found in the extent to which assessors follow standard procedures, partly because of differing views as to the nature of standard procedures, and partly because assessors used their own judgement in determining which tests should be given to each individual client. That is, many people adjusted the composition of the test battery in accord with the nature of particular disabilities, particularly purely physical versus cognitive disabilities. This issue is discussed further in 4.7 below.

4.6 NEED FOR NORMATIVE DATA

One of the basic requirements for a valid assessment system is normative data in terms of which to interpret test scores. While such data are available for standardised tests of basic sensory and motor capacities, they are largely lacking

for the off-road tests of driving skills (brake reaction time, slide test, road law test), and for on-road tests. Ideally, normative data should indicate the effects within a normal population of variations in age and where relevant, of driving experience (as pointed out by van Zomeren *et al*, 1988).

4.7 EVALUATION AND RECOMMENDATIONS CONCERNING CURRENT PRACTICE

Assessment of sensory capacities other than hearing is comprehensive, and there is no evidence of a need for more extensive assessment of hearing than at present. In the case of vision, it appears that the present assessment system is satisfactory, although current developments in assessment techniques, such as that for assessing "useful field of view", might in the future make a more detailed visual assessment cost-effective for drivers with suspected visual problems.

Considering the absence of significant documented relationships between other sensory or physical disabilities and crash risk, the current extremely comprehensive assessment of non-visual sensory systems and physical capacities appears to be unnecessary, except when required to enable the specification of appropriate vehicle modifications for people with significant physical disabilities. For drivers without such disabilities, the present extensive testing appears to be unnecessary.

In summary, current level of assessment of visual capacities is appropriate, but there appears to be excessive assessment of tactile, proprioceptive, kinaesthetic and motor response capacities.

In contrast, cognitive disabilities are tested relatively little. Since cognitive deficits are clearly implicated in increased crash risk, the current assessment system needs to incorporate more extensive testing of basic cognitive capacities. The literature documents several possible means of achieving this; most but not all require administration under the control of psychologists. There is a clear need to evaluate some of the documented tests in this area which have been shown to have predictive validity in relation to subsequent on-road performance, and which are suitable for use by occupational therapists or their assistants.

The current Australian system incorporates off-road tests of some driving-related cognitive skills at the tactical level (slide test, road law test); in this it is better than most other assessment systems. However, to achieve their purpose the tests need to be standardised and normative data obtained. These tests need to be evaluated against the video-based Driver Performance Test (Weaver, 1989), which the literature suggests is the most valid test of this general type. Development of an Australian version of this test with associated normative database may be worthwhile, particularly since it evidently has predictive validity in terms of the subsequent crash risk of "normal" drivers. Alternatively,

development of a modified version of the Hazard Perception Test, developed by VicRoads for use in normal driver licensing, may be preferable.

The currently recommended procedure for on-road assessment is better than most other systems, in that it entails use of set routes of graduated difficulty, with a standardised observation and scoring procedure. Unfortunately, current level of compliance with the standard is not high. In view of its importance in achieving reliability, steps need to be taken to increase compliance. It is also essential that normative data be obtained.

Current levels of compliance with recommended procedures for many off-road tests is less than satisfactory, given that reliability is only achievable when specified procedures are followed closely. Compliance with particular test procedures should improve when appropriate normative data are supplied to assessors.

In addition, compliance with the overall system in terms of administering all of its component tests may be increased by changing the system to omit some tests for people with particular, clearly diagnosed disabilities. Most obviously, many of the tests of physical capacities appear unnecessary for drivers without physical disabilities. Conversely, it should be possible to specify conditions where there is no significant risk of cognitive disabilities; in such cases, off-road tests of cognitive capacities and skills could be omitted.

5. CONCLUSIONS

5.1 REQUIRED CHANGES TO ACHIEVE "BEST PRACTICE" IN THE ASSESSMENT OF DRIVERS WITH DISABILITIES

Construct Validity

Overall, current Australian assessment practice has good construct validity except for its insufficient coverage of cognitive capacities and skills at the operational, tactical and strategic levels. Valid cognitive tests at the operational and strategic levels are well documented, particularly the former. At the strategic level, several researchers have identified a need to develop such a test.

It appears that the current very extensive assessment of tactile, proprioceptive, kinaesthetic sensory capacities and of motor response capacities should be reserved for cases of possible significant disability in these areas. Similarly, people with disabilities which undoubtedly are only physical might reasonably be exempt from tests of cognitive capacities and skills.

Criterion Validity

There is inadequate normative data for all components of the assessment system other than the standard off-road tests of sensory and motor capacities. The criterion validity of significant parts of the current system needs to be established. Norms should be different for people of different ages, particularly in the case of basic capacities. For driving-related tests, norms should also take account of differing levels of prior driving experience.

Predictive Validity of Off-Road Tests

Information is required on the relationship between off-road and on-road test performance. To the extent that on-road performance is based on basic capacities and skills which are tested off-road, a positive relationship should be demonstrable. However, less than perfect correlation would be expected since on-road performance is affected by higher-level skills and driving 'tactics' which are not assessable off-road.

Reliability

Progress towards a more detailed specification of on-road test procedures is evident; this direction needs to be followed further, and steps taken to achieve a higher level of compliance with standard assessment procedures. The provision of normative data is probably the most important factor required to achieve such compliance.

Compliance may also improve if the system is modified to allow for the omission of some tests for people with some specified types of disability, as suggested above.

5.2 OTHER ISSUES

A common theme among both driver assessors and licensing authorities was a perceived need for a greater level of awareness within the community, and the medical profession in particular, of the need for special assessment of drivers with disabilities. There was also a commonly perceived need for more effective dissemination of information on the nature and availability of the Australian occupational therapy driver assessment and rehabilitation system for people with disabilities, and for the provision of more resources to make this assessment service available more widely.

In addition, assessors commonly raised issues to do with the assessment system itself, particularly a need for information about its "objectivity", and for normative data to enable more meaningful interpretation of test performance. The views of assessors on the general nature of the assessment system, and the particular tests comprising it, were generally consistent with the evaluation and recommendations of this report.

There appears to be a growing awareness of the issues discussed in the following:

"Our society must balance: 1) the rights of disabled individuals to enjoy certain activities and maintain as much independence as possible; and 2) the right of the public to be protected from unreasonable danger. Necessary in striking this balance is the rehabilitation professional who seeks to increase the patient's activities and independence while also, at times, acting as the patient's advocate. However, acting to maximize independence, however well intentioned, without utilizing the reliable, valid and relatively comprehensive assessment tools now available will unnecessarily result in increased professional liability exposure."

(Antrim and Engum, 1989, p.19)

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APPENDICES

Appendix 1

Survey Format used to collect information from known Occupational Therapists.

Appendix 2

Content outline of the Driving and Vision Workshop for Occupational Therapy Driving Assessors, Caulfield General Medical Centre, Oct. 1992.

Appendix 3

A. Training course forms used by the University of Sydney, Driving Rehabilitation Education and Research Centre Driving Course, New South Wales, (NSW).

B. Training course forms used by the La Trobe University, Driving Rehabilitation and Education Course, Victoria, (Vic).

Appendix 4

A. Variations of the University of Sydney, Driving Rehabilitation Education and Research Centre Driving Course Forms, New South Wales.

- i. - Coorabel Rehabilitation Hospital, NSW,
- ii. - Hurstbridge Commonwealth Rehabilitation Services, NSW
- iii. - Julia Farr Centre, South Australia.

B. Variations of the La Trobe University Driving Rehabilitation and Education Course Forms, Victoria.

- i. - Ann Caudel Centre, Vic,
- ii. - Moonee Ponds Commonwealth Rehabilitation Services, Vic,

C. Forms used by Curtin University Driving Assessment Consultancy, Western Australia.

Appendix 5

1987 Version of the La Trobe University Driving Rehabilitation and Education Course Forms, Victoria.

Appendix 6

Licensing Authority Forms.

Appendix 7

Vic Roads, Draft for Discussion. Road Safety for Functionally Impaired and Older Drivers Report to the Minister for Transport by the Functionally Impaired Drivers Working Party, April, 1992. Table of Recommendations.