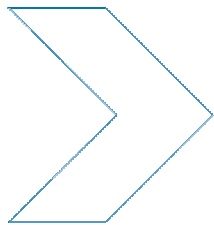


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Best practice criteria in practical driving tests of medically referred drivers

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Best practice criteria in practical driving tests of medically referred drivers

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ABSTRACT

Section 80 of the Motor Vehicles Act empowers the Registrar of Motor Vehicles to require drivers to undergo a practical test of their driving ability. These practical driving assessments (PDAs) are chiefly administered by Safety Education Officers (SEOs) employed by the Department for Transport, Energy and Infrastructure. Given the importance of licensure for a person's mobility and independence, PDAs must be of an excellent standard, producing valid and reliable outcomes for those who are assessed. Specifically, they must be structured so that they reliably produce the appropriate recommendations regarding each driver's medical fitness to hold a driver's licence.

This report provides a review of the literature published prior to 2006 concerned with the best methods for assessing medical fitness to drive. This enables comparisons between the methods used in South Australia and the best-practice methods described in the literature, which, in turn, enables the identification of possible improvements that could be made to the South Australian system. Possible improvements to South Australian practice include the greater involvement of occupational therapists in the assessment process, the use of an interview and functional testing prior to the on-road test, the use of a dual controlled vehicle provided by the testing agency, a longer duration of the on-road test, the presence of a third party in the vehicle during an on-road test to take detailed scoring notes, and the provision of counselling and advice when necessary at the completion of an assessment.

KEYWORDS

Driver testing and licensing, Fitness to drive, Literature review

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Summary

The appearance of literature pertaining to the use of practical driving tests in the assessment of medical fitness to drive is a relatively recent phenomenon. Despite this, the literature is sufficient to provide some guidance to practitioners seeking to design practical driving assessments (PDAs) that will reliably identify unsafe drivers. The preceding review of the literature published prior to 2006 and of South Australian practices has revealed a number of ways in which the latter could be improved to better approximate the methods recommended in the literature.

One of the main recommendations from the literature that could be implemented in South Australia is a greater role for occupational therapists (OTs) in the conduct of the PDAs. OTs have considerable expertise in the identification and evaluation of functional deficits and are well placed to determine the likely capability of drivers to compensate for their impairments. OTs should accompany the Safety Education Officers (SEOs) during PDAs so that they can observe the performance of the drivers referred for assessment and evaluate their capacity to benefit from retraining or adaptive equipment, bearing in mind the likely course of the condition(s) causing their deficits in functioning.

The presence of OTs in the car during PDAs will also be of benefit to the implementation of detailed, standardised scoring procedures. The most important objective of SEOs during an on-road test is to maintain the safety of themselves, the driver being evaluated, and other road users. Their ability to maintain safety would be considerably enhanced by no longer having to be responsible for scoring the driver's performance, while the OT, who does not have to concentrate on the maintenance of safety, would be able to record very detailed notes on the driver's behaviour during the test. It is important, however, that members of a multidisciplinary team respect each other's roles and responsibilities.

The use of OTs in PDAs also provides the opportunity for the greater use of pre-on-road assessments. An interview with the driver can yield important information regarding the role that driving plays in their life and the degree of insight they have into the reasons for their referral. The degree of insight is a good indicator of the driver's likely ability for self-monitoring and adherence to restricted licence conditions. Observations of driving performance by the OT can also be guided by the results of pre-on-road testing of sensory, physical and cognitive abilities. The nature of functional deficits identified by standard 'laboratory' tests provide a useful guide for which aspects of driving performance are likely to be problematic for the driver. Given this information, the OT can then focus on these aspects of performance and assess the degree to which the driver is able to compensate for their deficits.

PDAs should also be conducted in dual controlled vehicles, rather than the vehicle normally driven by the driver being assessed. The main reason for this is one of safety. In a dual controlled car, the SEO would be better able to ensure safety on the test. The use of the same car for all PDAs would also aid the standardisation of the assessments. Without standard vehicles, drivers may be at an advantage or disadvantage according to the quality of the car they own. It is essential, however, that the standard vehicle used in a PDA matches the vehicle normally driven by the driver according to whether it is fitted with an automatic or manual transmission. The use of a vehicle unfamiliar to the driver also necessitates that a period of driving in a safe environment (e.g. closed course, car park) is set aside prior to the test so that the driver can familiarise themselves with the standard vehicle provided by the testing agency.

Another way in which South Australian practice could be improved is by requiring more lengthy on-road evaluations. The public road component of PDAs in South Australia lasts for 25 minutes, compared to an average reported in the literature of 45 minutes, and a recommendation from a focus group of OTs of one hour. PDAs need to be long enough to provide a sizeable sample of driving performance and provide multiple opportunities to assess the ability to perform the same driving manoeuvres. In South Australia, there is an

allowance for double assessments (50 minutes) in cases for which it is deemed to be beneficial but it would be ideal if all assessments were this long. However, South Australian PDAs are consistent with the recommendations provided in the literature that tests should be based on standardised routes and set manoeuvres.

The scoring system available for use in South Australia is appropriately detailed but the inability of the SEO to take notes during the drive precludes the use of the scoring protocol. The presence of an OT in the back seat would make it possible to record detailed notes on the driver's performance that would enhance the reliability of the tests and aid in communicating and explaining the test outcomes to the drivers. However, South Australian practice is consistent with the recommendations in the literature for extra weighting to be given in the tests to more serious driving errors, while habitual errors that do not greatly increase crash risk receive less attention. The strong emphasis given to driving instructor interventions in South Australian PDAs is also consistent with the literature.

PDAs in South Australia can lead to a wide variety of different licence recommendations. The availability of a variety of options is consistent with the literature, and with the ideal of promoting the continued mobility of older drivers. The further involvement of an OT in the process of evaluating the driver and formulating recommendations would be of considerable benefit in enabling mobility for drivers affected by functional deficits for which adaptation and compensation are possible.

South Australian practice could be improved with regard to the follow-up discussions with drivers having their driving assessed. Greater assistance could be provided with the purchase and fitting of adaptive equipment, although the current preparation of an information brochure is a step in the right direction. The provision of immediate counselling and information regarding alternative transport options for *all* drivers whose licences are cancelled would also be an improvement, although it should be recognised that follow-up counselling from the driver's general practitioner or a social worker may be necessary as well. The loss of a licence can be a distressing experience for older drivers, many of whom rely on driving for their independence and mobility, and so counselling should be provided as soon as the driver is informed of the licence cancellation decision. The implementation of pre-on-road interviews and functional testing, and presence of an OT in the vehicle during the PDA, would also provide a better basis for post-assessment counselling from the OT. The OT would have a better idea of how the driver performed during the test and the driver would be more familiar with the OT.

Finally, it must be recognised that the recommendations in the literature are not based on best practice determined by assessments of the validity of on-road driving tests. The validity of these tests is not able to be examined because of the lack of opportunity for those whose licence has been cancelled to be involved in crashes that would justify their categorisation as unfit to drive. However, an assessment of the post-PDA experience of drivers allowed to continue driving but with adaptive equipment or restricted licences would be a useful area for future research. If the decisions by the assessors were appropriate, these drivers should not have more crashes than drivers who are allowed to continue driving without restrictions.

Practical driving assessments to determine medical fitness to drive are a relatively new field of practice. Much improvement in methods and expertise can be expected in the years to come. Specifically, further experience in the conduct of such assessments and further research can both be expected to lead to improvements in PDAs in the future. Nonetheless, experience so far has suggested a number of components that characterise equitable practical driving assessments. In South Australia, many of these components are already in place. However, there is still considerable scope for PDAs in South Australia to be updated to better represent current thinking on the best methods for assessing fitness to drive.

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1 Introduction

Section 80 of the Motor Vehicles Act empowers the Registrar of Motor Vehicles to require drivers to undergo a practical test of their driving ability. These practical driving assessments (PDAs) are chiefly administered by Safety Education Officers (SEOs) employed by the Department for Transport, Energy and Infrastructure. Given the importance of licensure for a person's mobility and independence, PDAs must be of an excellent standard, producing valid and reliable outcomes for those who are assessed. Specifically, they must be structured so that they reliably produce the appropriate recommendations regarding each driver's medical fitness to hold a driver's licence.

This report provides a review of the literature published prior to 2006 concerned with the best methods for assessing medical fitness to drive. This enables comparisons between the methods used in South Australia and the best-practice methods described in the literature, which, in turn, enables the identification of possible improvements that could be made to the South Australian system.

2 Background - the South Australian system

Before a discussion of the literature pertaining to PDAs used to assess fitness to drive, it is necessary to provide some background information regarding the assessment procedures currently used in South Australia. The following sections briefly describe the procedures used in South Australia for referral of drivers, and the centres at which assessments take place. Information regarding the driving assessors, testing prior to the PDA, the nature of the PDA, the scoring of the PDA, licence recommendations, and post-assessment discussions with the driver are provided in section 3, immediately following the best practice review for each of these facets of fitness to drive evaluations. The information concerning South Australian practices was obtained through an interview on May 17, 2005 with Mareeta Dolling, the Clinical Management Coordinator at Licence Services.

2.1 The referral process

Although establishing best practice for referral of drivers for assessment is beyond the scope of this report, it is important background knowledge for a discussion of fitness to drive assessments. Drivers whose fitness to drive is to be assessed are referred to Medical Review Officers at Licence Services, part of Driver and Vehicle Licensing. Approximately 50 percent of referrals are made by general practitioners, often through the annual medical review for drivers aged 70 or more but also when any driver's medical condition is of sufficient severity to warrant concern according to the Austroads medical standards for licensing (Austroads, 2001). Police also refer drivers to Medical Review after a crash. Police will refer drivers if the circumstances of the crash and their observations of the driver suggest the possibility that the driver is not medically fit to drive. Data are not available to allow determination of whether the police are good at identifying functionally impaired drivers or whether they are unfairly nominating older drivers for assessment. Referrals may also come from various specialised hospitals, various specialists (geriatricians, neurologists, cardiologists, ophthalmologists, optometrists, drug and alcohol units, psychiatrists) and from 'concerned citizens' (usually family members or friends). Concerned citizens can refer drivers for a PDA by writing a letter to the Registrar of Motor Vehicles or to Driver and Vehicle Licensing in which they outline their concerns about a person's fitness to drive. A medical certificate and/or PDA can then be requested by the Registrar. It is very rare for drivers to refer themselves for a PDA. This is in contrast to the regular self-referral of drivers who were assessed at the now disbanded Driver Assessment Rehabilitation Service (DARS) at the University of South Australia. Staff at DARS were authorised to make recommendations regarding licensure on the basis of their assessments, yet their independence from the licensing body seemed to encourage drivers to refer themselves for PDAs there: something which does not happen for PDAs conducted by representatives of Driver and Vehicle Licensing.

There are a number of distinct groups of drivers who are typically referred by medical practitioners or specialists for fitness to drive assessments. One such group of drivers consists of those aged over 70 who are referred, not for any specific medical condition, but to assess the general effects of ageing. This group is referred mainly through the annual medical review process for drivers aged over 70. The general practitioner is often contacted by the Medical Review Officers to provide more information about the driver and the particular problems identified by the doctor as necessitating the assessment. Another group of drivers referred for PDAs consists of those affected by the sequelae of Cerebro-Vascular Accidents (strokes) or traumatic brain injuries. A third commonly referred group is that of drivers requiring vehicle modifications in order to drive. This group includes drivers who have suffered injuries (e.g. spinal, amputations), those affected by neurological conditions (e.g. Cerebro-Vascular Accidents, Multiple Sclerosis) or those affected by other musculoskeletal problems (e.g. Arthritis). Drivers are also often referred for an assessment because of cognitive impairment associated with dementia, or because of the combination of cognitive and motor impairments associated with Parkinson's Disease, Multiple Sclerosis

or other neurological conditions. Note that, with the exception of the first group, all of these groups can include drivers of any age group.

2.2 Assessment centres

South Australia is divided into three regions for PDAs: metropolitan, regional and country. There are two assessment centres within the metropolitan area: one at Oaklands Park and the other at Walkley Heights. The staff available at these centres for conducting PDAs consists of two Safety Education Officers (SEOs) (see section 3.1.2). 'Regional' areas include the Adelaide Hills, Victor Harbor, Murray Bridge, Gawler, Port Lincoln, Whyalla and Port Augusta. The assessments at regional centres are also conducted by the metropolitan SEOs. Areas of the state outside of the 'regional' areas include the South East, the Riverland and Yorke Peninsula. There is one SEO based in the Riverland and one in Mount Gambier. In some of the more remote country centres, assessments are sometimes conducted by members of the South Australian Police. In other cases, such as when a member of the police is not available or when a more complicated assessment of competence is required, an SEO must conduct the assessment. In these cases, the SEO must make a special trip to conduct the assessment (necessary if the driver is being assessed for a restricted location licence) or the driver must travel to a regional centre.

3 Best practice review

This section of the report provides a summary of the literature published prior to 2006 regarding current theories about best practice in practical driving assessments. These practices are then compared with the current practices in South Australia. This is done so that ways in which South Australian practices can be improved are able to be identified.

3.1 Driving assessors

3.1.1 Literature

One of the most important components of a fitness to drive assessment is the choice of personnel to conduct the PDA. The assessment of fitness to drive involves the identification and assessment of functional deficits, rather than an assessment of the level of skill development, as in driver licence entry examinations (DiStefano & MacDonald, 2003). Therefore, expertise beyond knowledge of road law and 'road craft' is necessary for fitness to drive assessments. McKnight and McKnight (1998, in NHTSA, 1999) and Wang, Kosinski, Schwartzberg and Shanklin (2003) both caution that road tests should only be used to detect functional deficits if the observations of driving performance are made by examiners with experience in identifying and assessing such deficits.

The best method of incorporating appropriate expertise into a PDA is to require the presence of an occupational therapist (OT) (Hunt, 1996; NHTSA, 1999; Stutts & Wilkins, 2003). OTs are not only able to identify physical and cognitive problems that can negatively affect a person's driving ability but are also trained to identify which problems are able to be ameliorated through formal lessons or vehicle modifications. Such knowledge is essential to the process of making recommendations regarding licensure.

One example of an assessment program utilising OTs is DriveWise, a driving fitness evaluation program run at the Beth Israel Deaconess Medical School in Massachusetts, USA. DriveWise is an evaluation program designed by OTs and behavioural neurologists. It includes an assessment of each driver's transport needs and options by a social worker, a neuropsychological examination, a one hour functional assessment by an OT and a 45 minute on-road driving assessment with an OT and driving instructor. The driving instructor guides the driver through the on-road course, while the OT evaluates the driver's performance. The on-road assessment places an emphasis on manoeuvres that are difficult for cognitively impaired drivers (e.g. turns across oncoming traffic). An evaluation team meets to review the findings and a social worker communicates the recommendations to the driver and his or her family (NHTSA, 1999).

DiStefano and MacDonald (2003) claim that the role of OTs in assessment of older drivers is widely acknowledged but note that the status of OTs within the driver licensing system varies widely between jurisdictions in Australia. In Victoria, whether a driver is assessed in a standard licence review test with a driving instructor or in a test assessed by an occupational therapist is determined by the contents of their medical report form forwarded to VicRoads by the referring agent (DiStefano & MacDonald, 2003).

The usefulness of OTs is not restricted to their expertise in assessing the implications of drivers' functional deficits. The inclusion of OTs in the PDA process also has benefits related to pre-on-road tests, scoring of the PDA, safety during the PDA and follow-up after the PDA. These benefits will be described in the appropriate sections.

Galski, Eble, McDonald and Mackevich (2000) did sound a note of caution, however. They pointed out that it is important that all members of a multidisciplinary team have clearly defined and differentiated roles. If members of the team overstep the boundaries of their responsibilities, the system will not work as well and the validity of the recommendations made on the basis of the assessments may suffer. Therefore, in the PDA itself, driving

instructors and OTs are both able to provide useful input to the process but must respect each other's separate roles and responsibilities.

3.1.2 South Australian practice

The Safety Education Officers (SEOs) who conduct the PDAs in South Australia are trained driving instructors and are capable of assessing licensure for light and heavy vehicles, and motorcycles, in addition to cars. They have expertise in assessing adherence to road laws and the exhibition of 'road craft'. That is, they are trained to assess the ability to drive according to the laws and safely interact with other traffic. However, they have no medical training. There are courses available for them to learn about medical issues and driving, which are mainly concerned with how to effectively interact with older drivers who are having their driving assessed or are undertaking tuition. No OTs or other health professionals are present during the PDA, so the SEO and the driver being assessed are the only two occupants in the vehicle when the assessment is taking place.

3.2 Testing prior to the PDA

3.2.1 Literature

The literature describes two different components of the pre-on-road-test evaluation that are commonly employed in fitness to drive evaluations. These are functional testing and an interview.

Functional testing incorporates assessment of the driver's sensory, physical, and cognitive skills, with an emphasis on skills necessary for safe driving. The main reason for including such testing in fitness to drive evaluations is that it guides the on-road evaluation. By observing a driver's functional test performance, a skilled evaluator will know the components of the on-road test that will be likely to be difficult for the driver (NHTSA, 1999; Stutts & Wilkins, 2003). The nature of observed functional deficits may also offer a guide for the likely success of rehabilitation and retraining (Hunt, 1996).

NHTSA (1999) documents the pre-on-road testing conducted in a number of US states and fitness to drive assessment agencies, including Ohio, Pennsylvania, Bryn Mawr Hospital in Pennsylvania, De Graff Memorial Hospital in New York, UAB Health System in Alabama, Sinai Rehabilitation Centre in Maryland, and the Beth Israel Deaconess Medical Centre in Massachusetts. In these jurisdictions and agencies, tests are commonly conducted of vision, cognition, reaction time, attention, and physical functioning. In Ohio, for example, drivers undertake assessments of their vision (static visual acuity, depth perception, visual fields, acuity under glare conditions), cognition (Mini Mental State Examination, Trail-Making Test), and physical functioning (range of motion, strength, endurance). Some of the assessments are very lengthy. At both the Sinai Rehabilitation Centre in Maryland and the UAB Health System in Alabama, nearly 1.5 hours of clinical testing are done prior to the on-road test. At the Beth Israel Deaconess Medical Centre in Massachusetts, a one hour assessment by an OT is preceded by a detailed neuropsychological examination of concentration, organisational skills, reasoning, judgement and speed of information processing. The Mobility Advice and Vehicle Information Service in Berkshire, England also includes a clinical assessment of sensory and physical functioning as part of its fitness to drive evaluations (NHTSA, 1999).

The Physician's Guide to Assessing and Counselling Older Drivers (Wang et al., 2003) published in the United States by the National Highway Traffic Safety Administration (NHTSA) recommends the use of a clinical assessment that includes examination of the driver's visual and perceptual capabilities, range of motion, motor strength, co-ordination, sensation, reaction time, and cognitive functioning. The authors add that an on-road test should still follow poor performance on the clinical assessment because a driver with functional deficits may still be able to drive safely because of over-learning of the driving

task. Also, the driver and their family would need evidence from an on-road assessment of driving difficulties (Wang et al., 2003).

The other component of a pre-on-road assessment is the driver interview. This can aid the assessor in two ways. First, it enables the assessor to get a picture of the role of driving in the driver's life, their driving habits, driving needs, and the degree of social support they have. Such knowledge is important in determining how the driver would cope with restrictive licence recommendations, including licence cancellation (NHTSA, 1999). Secondly, an interview can aid the assessor in determining the cognitive abilities of the driver. More specifically, it can aid the assessor in determining whether the driver has insight into their driving abilities and the reasons for their referral (Brown, 2003; Hunt, 1996; NHTSA, 1999). Brooks and Hawley (2005) and Van Zomeren, Brouwer and Rotengatter (1988) nominate insight as one of the most important capabilities for returning to safe driving after a brain injury. Insight is likely to be an essential ability for appropriate monitoring of one's driving performance, for self-regulation, and for adherence to licence conditions.

The importance of pre-on-road testing and interviews again points to the usefulness of a multi-disciplinary team. A full pre-on-road assessment could require the services of a social worker (interview), neuropsychologist (testing) and OT (interview and testing).

3.2.2 South Australian practice

The assessment centres do not undertake any testing of the drivers other than the on-road test. In some cases, the Medical Review Officers, on recommendation and under supervision of the Clinical Management Co-ordinator, may contact the driver's medical practitioner to ask whether vision, neuropsychological or other specialist tests have been administered to the driver. If the reason for the driver's referral suggests the need for certain tests (e.g. a driver with glaucoma should have his or her peripheral vision assessed), then the Medical Review Officers can request that such tests be conducted prior to arrangement of a PDA. The Clinical Management Co-ordinator, who is an OT, discusses the test results with the SEO and points out the likely impact that functional impairments detected by the tests would have on driving ability.

In some cases, an interview is conducted with the driver prior to the PDA. This is mainly done with drivers who are being assessed for a restricted area licence. The interview is done in order to find out where the driver needs to drive, so that the PDA can be designed appropriately. The interviews are either conducted by the Clinical Management Co-ordinator or by Medical Review Officers under the Co-ordinator's supervision.

3.3 The nature of the PDA

3.3.1 Literature

Dual controlled cars

The literature on PDAs suggests that there are benefits to the use of dual controlled cars (i.e. dual control brakes, and often other controls, such as an engine cut-out switch), with many jurisdictions and agencies using them (NHTSA, 1999). In Sweden, for example, vehicles with dual brakes were made mandatory for PDAs in 2000 (Lundberg & Hakamies-Blomqvist, 2003). Fox, Bowden and Smith (1998, p1292) recommend the use of dual controlled cars for two reasons.

The most important reason is that it enhances the safety of the driving assessors in the vehicle and also the safety of other road users in the on-road test (Fox et al., 1998). The Driver Assessment Rehabilitation Service at the University of South Australia conducted its assessments in a dual controlled vehicle, chiefly for this reason. Particularly with cognitively impaired drivers lacking in insight, it was important that the driving instructor could avert dangerous situations using his or her controls. On occasions, this agency conducted

evaluations in the driver's own vehicle but only under special circumstances. These included circumstances when driver performance on the initial assessment had been inconsistent (safe and unsafe performance on the same test categories) or contrary to the driver's and driver's family's expectations of performance, and when the likelihood of safety of the assessors had been established in the dual controlled car assessment. Vehicles provided by the testing agency for a fitness to drive assessment were always matched to the driver's own vehicle in terms of automatic or manual transmission (Angela Berndt, Clinical Director, Driver Assessment Rehabilitation Service, personal communication, August 15, 2003).

The second reason for using a vehicle provided by the agency, rather than the driver's car, is that it contributes to the standardisation of the assessment. It ensures that all of the drivers undertake their PDAs in vehicles with identical technical specifications, thereby making the assessments more equitable (Fox et al., 1998).

A study by Lundberg and Hakamies-Blomqvist (2003) did question the fairness of requiring older drivers to undertake PDAs in an unfamiliar vehicle. A comparison of pass/fail rates prior to and after the mandating for dual controlled vehicles in 2000 in Sweden revealed that there was a reduction of 20 percent in the number of drivers who, having failed an initial test, passed a second one. The percentage of drivers passing first time increased by four percent. The authors concluded that older drivers with normal or superior skills (first time passes) were not negatively affected by the unfamiliar vehicle, while those with marginal driving skills (those who, in their own car, failed the first time but passed the second) were more likely to lose their licence when being assessed in an unfamiliar vehicle (Lundberg & Hakamies-Blomqvist, 2003). However, one possible confounder in the study was choice of transmission. In the period prior to the new mandate, 28 percent of tests were performed in vehicles with an automatic transmission, while in the second period, 12 percent of tests were in automatic vehicles. The lower numbers of tests with automatic vehicles in the second period was "to some extent at least, due to the fact that such vehicles were not always available at the test site" (Lundberg & Hakamies-Blomqvist, 2003, p168). This suggests that some drivers were forced to perform their tests in unfamiliar manual vehicles rather than the automatic vehicles that they would have chosen. The authors did make the interesting suggestion that inexpensive dual brakes could be fitted to the driver's own vehicles. This would enable safety during the assessment without the unfamiliarity of the vehicle (Lundberg & Hakamies-Blomqvist, 2003) but would compromise the goal of standardisation of the PDA procedure.

Closed course component

Another common aspect of PDAs is the use of a closed course driving component prior to the component conducted on public roads (NHTSA, 1999). Fox et al. (1998) argue that closed road tests are useful for examination of simple vehicle operations (steering, braking, gear changes) and determination of whether the driver is ready to proceed to an evaluation on public roads. Some drivers may be identified on the closed course section as unable to adequately operate the controls of the vehicle and so the more risky public road component can be cancelled. For those who have no difficulty operating the controls of the vehicle, the public road component can then be attempted in order to evaluate the driver's ability to interact safely with traffic and the road system.

Another reason for the usefulness of the closed course component is that it enables the driver to become familiar with an unfamiliar vehicle. That is, if the assessment agency provides a dual controlled vehicle for the PDA, a session of driving on a closed course, practising simple manoeuvres, gives the driver the opportunity to familiarise themselves with the controls and handling of the vehicle. PDAs administered by the Driver Assessment Rehabilitation Service, for example, would include a period of 15 minutes for familiarisation with the vehicle in a warm and encouraging verbal environment. Drivers were told that it was 'OK to make mistakes' while familiarising themselves with the vehicle, and the time was also used by the assessors to reassure the driver that feeling apprehensive was normal (Angela Berndt, personal communication, August 15, 2003).

The most complex closed course component is that used by The Mobility and Vehicle Information Service in the United Kingdom. Prior to the test on public roads, this agency administers a one-hour structured closed course assessment requiring the completion of ten exercises. The instructions for the closed course component are standardised and each exercise is scored on a four point scale from 1 = definitely unsafe to 4 = definitely safe. The course is based on a private road system on the grounds of the Transport Research Laboratory which includes road markings, a roundabout, and traffic signs and signals. The exercises are designed to assess operation of controls, perception of the environment, spatial skills, choice reaction, choice reaction under additional workload conditions, orientation, memory, motor co-ordination and information processing. These skills are all assessed a number of times during the closed course test. Similarly to the Driver Assessment Rehabilitation Service, a period of driving in which drivers can familiarise themselves with the vehicle precedes the scored portion of the assessment (Brown, 2003).

It is important to note that a closed course drive is no substitution for a public road test (Fox et al., 1998). Unlike driving on public roads, driving on a closed course lacks the time pressure of real traffic and so is self-paced, enabling compensation for slowed processing. Drivers must be evaluated for their ability to interact with other traffic and with the demands of the public road system, and so a closed course test is only useful for assessing the most basic vehicle handling manoeuvres and the readiness for a public road test.

Public roads component

The use of road tests conducted on public roads is claimed to be an essential component of fitness to drive evaluations (Fox et al., 1998). The most important characteristics of a suitable on-road test are that the test is conducted on a standard route with standardised instructions and is of a sufficient duration to obtain an adequate sample of driving performance on which to base a licensing decision. There are also a wide variety of suggestions in the literature for the types of tasks that should be included in the on-road test.

The main reason for implementing standardised test routes and instructions is to improve the uniformity of test administration and enhance the reliability of the test (Fox et al., 1998; McPherson & McKnight, 1981). McPherson and McKnight (1981) argue that standardised test routes allow for the same number of total observations and observations of each type of performance to be made in each test, and ensure that the assessor's attention is directed towards the same aspects of driving performance each time at a particular location on the test route. It also, they argue, aids the uniformity and reliability of scoring (see section 3.4). Fox et al. (1998, p1295), after reviewing on-road assessment practices for brain-impaired drivers, conclude that a "valid, reliable assessment of driving competence" is best achieved "by observing an adequate sample of driving behaviour in real traffic, over a standardised route with pre-determined manoeuvres".

With regard to the standardised instructions used in on-road tests, the guide for fitness to drive evaluations prepared by NHTSA (1999) suggests that instructions to drivers during an assessment should be brief, non-technical and be in general terms. They should involve the specification of manoeuvres at landmarks rather than at named streets. To use street names would favour drivers who were familiar with the area in which the tests was conducted, while drivers unfamiliar with the area would be required to search for a street sign, thus necessitating an additional visual task. Drivers should also be told only what route to follow, without any instructions regarding travelling speed or lane choice. The location of a set manoeuvre should always be stated prior to the nature of the manoeuvre (NHTSA, 1999). For example, the assessor could say, "At the next intersection, turn left."

NHTSA (1999) suggests that drivers who fail a driving test could be re-tested in their own area if they choose. Familiarity with the route and the traffic control devices within the driver's own area may improve the driver's performance. Supporting this, studies by Staplin, Gish, Decina, Lococo and McKnight (1998) and Janke and Hersch (1997) found that older drivers made more errors in unfamiliar, rather than familiar, areas when negotiating

uncontrolled or Yield (Give Way) sign controlled intersections. Also, in unfamiliar areas, older drivers were more likely to stop for no reason, turn too wide or short, fail to stop at Stop lines, drive too slowly, or accept unsafe gaps when turning across oncoming traffic. Assessments only conducted in areas familiar to the driver could require the driver to drive from their home to various places they need to visit (e.g. doctor's surgery, supermarket). However, the driver would only be able to apply for a restricted licence (NHTSA, 1999). As noted by DiStefano and MacDonald (2002), self-selected routes close to a person's home can only be used as the basis for a restricted licence because using such testing procedures may result in inadequate opportunities to observe the full range of possible driving situations that can be encountered in the road system.

The duration of the test must be sufficient for common driving manoeuvres that are required in normal traffic to be observed several times (Fox et al., 1998). This allows for enough opportunities for the assessor to observe errors and possible training needs for the driver. The duration of a number of standardised fitness to drive evaluations is provided in Table 3.1.

Table 3.1
Duration of various standardised on-road tests to evaluate fitness to drive

Agency	Duration of assessment (mins)	Source
Vicroads, Victoria, Australia	45	(DiStefano & MacDonald, 2002)
Driver Assessment Rehabilitation Service, South Australia	40-60	(Baldock, 2004)
Bryn Mawr Hospital, Pennsylvania, USA	60	(NHTSA, 1999)
UAB, Alabama, USA	30-45	(NHTSA, 1999)
Sinai Rehabilitation Centre, Maryland, USA	90	(NHTSA, 1999)
Beth Israel Deaconess Medical Centre, Massachusetts, USA	45	(NHTSA, 1999)
Mobility Advice and Vehicle Information Service, UK	25	(NHTSA, 1999)
Swedish National Road Administration, Sweden	60	(Lundberg & Hakamies-Blomqvist, 2003)

Table 3.1 shows that on-road driving assessments typically range in duration from half an hour to 90 minutes, with the average assessment taking approximately 45 minutes. The shortest assessment duration is the 25 minute on-road test at the Mobility Advice and Vehicle Information Service in the United Kingdom. However, it must be noted that this occurs after a detailed, one hour assessment on a closed course circuit featuring road markings, a roundabout, and traffic signs and signals (section 3.3.1.2). The entire evaluation, including an interview and physical/sensory assessment takes approximately four hours (NHTSA, 1999). A focus group of OTs in the USA agreed that an hour was the appropriate duration for an on-road assessment of fitness to drive (Stutts & Wilkins, 2003).

Although it is agreed that driving tests should be of sufficient duration to observe a large sample of driving performance, and that assessments should be standardised, there is considerable variation between agencies in the tasks required of drivers being assessed. The following paragraphs describe some of the on-road driving tests used at different agencies and in different jurisdictions.

The on-road evaluation at Bryn Mawr Hospital in Pennsylvania, USA, begins in a car park, before moving onto rural secondary roads, a limited access highway, a shopping centre car park, and into downtown traffic. Thirty areas of performance are judged, including lane position, visual checks, following distance, judgement of space, speed control, attention to traffic devices, and memory (NHTSA, 1999).

The Sinai Rehabilitation Centre in Maryland, USA, assesses driving performance in a car park, followed by performance on residential roads, country roads and city roads. Skills assessed include vehicle entry, starting procedures, acceleration, braking, lane position,

managing hazards, negotiating controlled and uncontrolled intersections, executing turns, driving on an expressway, parking, observation skills, and endurance (NHTSA, 1999).

Dobbs (1997) argued that assessments of cognitively impaired drivers should include a large number of left and right turns under varying intersection control conditions, and also left, right and through manoeuvres at uncontrolled intersections. The on-road course should also include visually complex environments, featuring moderate to heavy traffic flow and with multiple lanes of traffic in each direction. Drivers should also have to perform tasks that require planning and working memory. For example, drivers should be asked to drive to a particular destination. Dobbs claimed that a portion of the test driving on a freeway was unnecessary.

The Mobility Advice and Vehicle Information Service in the UK uses a graduated route that progresses from initial light traffic conditions to complex traffic situations, before returning to the mobility centre. There are 20 points on the route at which driver performance is assessed on a four point scale, similarly to the closed course section (1 = definitely unsafe to 4 = definitely safe). Roundabouts are common on the set route, with assessors noting the drivers' regulation of speed on approach to the roundabout, their positioning while approaching, on, and leaving, the roundabout, and their observations at the roundabout. Drivers are also, at one point, asked to count to 30 while negotiating a roundabout, so that their divided attention can be assessed. Selective attention is assessed by asking drivers to locate elderly people signs along the route. Drivers' abilities for independent decision making are assessed by asking them to follow signs through a series of four roundabouts to arrive at a specific motorway (Brown, 2003).

The Driver Assessment Rehabilitation Service in South Australia used a standard route that consisted of three sections (excluding the vehicle familiarisation phase) that differed in terms of the demands placed on the driver. The low demand section took place on low-traffic, residential streets and mainly involved negotiating roundabouts. The moderate demand section involved driving on arterial roads but did not require complex manoeuvres. In this section, all intersections were negotiated by driving straight through or turning with a dedicated turning arrow. In the high demand section, drivers had to perform unprotected right turns at intersections on arterial roads, as well as merging manoeuvres on multi-lane roads and driving in areas featuring high pedestrian activity. There were a total of 71 driving manoeuvres in the test. Each type of manoeuvre in the test was performed on multiple occasions and each manoeuvre was assessed for the drivers' visual checks, travelling speed, use of indicators, gap selection and vehicle positioning (Baldock, 2004).

The licensing agency in Wisconsin, USA, does not have a standardised test but does require a minimum set of basic manoeuvres to be performed. These include two left turns, two right turns, a lane change, a 'driveway turn around', a hill start, and a 'quick stop'. Other manoeuvres may be added at the discretion of the examiner. These additional manoeuvres are determined on the basis of the outcomes of functional assessments conducted prior to the on-road test. If the driver has limited mobility of their upper body and neck, then the driver is asked to perform an additional turn around in a driveway, additional lane changes, and to frequently pull over to the kerb before re-entering the traffic stream. If the driver has vision problems, then the driver is asked to drive on a highway with various speed limits and traffic signs. The driver must tell the assessor what action must be taken in response to the signs. The assessor should be able to judge how well the driver can see and respond to signs at different speeds, while also noting the driver's positioning in lanes, especially when the lane configuration changes. If the driver has arthritis, then the driver should be tested in moderate to heavy traffic in which there are many stops and starts. If the traffic volume is low, the driver can be asked repeatedly to pull over to the kerb. If the driver is being assessed following brain trauma, then the assessor should check that the driver is able to follow directions, is not confused and does not take a long time to react to instructions or events in traffic (NHTSA, 1999). Although the agency in Wisconsin has developed these broad guidelines for assessing drivers with different functional impairments, a standardised test of sufficient length would be adequate to assess all of these aspects of driving performance, with the observations made by the assessor guided by the pre-on-road

functional assessment. The guidelines for specifically targeting likely areas of difficulty are only necessary in the absence of a standardised test of reasonable duration.

3.3.2 South Australian practice

Driver's own vehicle

The majority of PDAs in South Australia are undertaken in the driver's own vehicle, thus denying the SEO access to the safety benefits of dual controls. The SEO does check the vehicle for road worthiness, however, ensuring the proper functioning of the vehicle's brakes and indicators et cetera. Some drivers who have been receiving tuition in an adapted vehicle request that the PDA be undertaken in that vehicle rather than their own. The adapted vehicle is provided by a private driving instructor and is hired by the driver at their own cost.

Closed course component

The first part of the PDA in South Australia involves a short drive on a closed course in the assessment centre car park. This is done to help establish rapport between the SEO and the driver, and also allows for assessment of the driver's ability to manoeuvre the vehicle and operate the controls competently in a no-traffic environment without any risk to the public. If the driver is having great difficulty operating the controls of the vehicle, then the SEO may be able to end the assessment prior to driving onto public roads. In cases for which a driver with physical impairments is being assessed with regard to the need for vehicle modifications, the closed course section of the test can be extended.

Public roads component

The public road component of the PDA (in the metropolitan area) is done on a set route and takes approximately 25 minutes to complete. In some cases, a 50 minute test is used. This is often done for drivers referred by OTs for assessments of fitness to drive because of a neurological condition or after a brain injury. The reason in these cases for longer assessments is that such drivers may have fatigue and concentration difficulties and a longer drive is a better way of assessing the effects of such problems. Double length assessments are also often used for drivers who need to undertake long distance driving.

The set routes are either based around the assessment centres or, in regional areas, around the police station or customer service centre. For restricted area licences, the route must be organised around the driver's home. There are two different possible set routes for each metropolitan assessment centre. If a driver is assessed for a second time, they are usually assessed on the other route, rather than the route that was used for the driver's first test.

As the standard driving test route takes only 25 minutes to drive through, there is a limit to the number of abilities that can be assessed in the test. There is also a limit to the number of times that different abilities can be assessed. Abilities assessed in the test include: moving off, reversing, stopping, moving off on a slope, changing gears, three point turns, general driving, overtaking, lane changes, turning to left and right, obeying traffic signs and signals, and hazard recognition and response.

3.4 PDA scoring

3.4.1 Literature

Scoring of PDAs is a complex task but there are a number of characteristics that have been identified in the literature as contributing to an optimal method. These include using a detailed, standardised scoring protocol that features a breakdown of the components of all specific driving manoeuvres; having a third party in the vehicle to score the driver's performance; and, most importantly, attaching greater significance to particular types of

errors while not devoting much attention to poor driving habits typical of many medically fit drivers.

Uniformity and reliability of scoring is likely to be enhanced by using a standard scoring protocol for all PDAs. Such a standard scoring protocol would have to be combined with the standard test route advocated in section 3.3.1.3. The aim of standard scoring protocols combined with a standard test route is that examiners will judge all drivers on the same pre-defined criteria throughout all parts of the test, and will learn what aspects of performance to concentrate on at specific points along the test route (NHTSA, 1999).

Fox et al. (1998) advocated that all driving manoeuvres in a PDA be broken down into their component tasks, each of which should be rated for their correctness. By rating all of the component actions rather than just rating whole manoeuvres, it is possible to identify the specific inadequacies in driving actions that are potentially amenable to training (Fox et al., 1998). As noted by DiStefano and MacDonald (2003), detailed scoring of performance also provides valuable guidance for arriving at licensing recommendations.

A good example of a standard scoring protocol combined with a standard test route was that of the Driver Assessment Rehabilitation Service in South Australia. As noted in section 3.3.1 all manoeuvres in the test were broken down into their component tasks and assessed for the drivers' visual checks, travelling speed, use of indicators, gap selection and vehicle positioning. Each component task was classified by the examiner as either correct or incorrect, or as safe or unsafe. The total number of component tasks judged in the test route was 418 (Baldock, 2004). As well as providing a reliable and uniform method of scoring, this process produced a very detailed account of the driver's performance in the PDA and was a considerable aid in providing feedback to the driver. For example, a driver could be informed that their speed of approach to turns was too high rather than merely informing them that they did not perform turns well. In this way, the use of a standard scoring protocol means that overall driving problems can be compartmentalised into specific problems that may be able to be addressed.

As also noted in section 3.3.1, the Mobility Advice and Vehicle Assessment Service in the UK uses a standardised route and a standardised scoring procedure. Although scores from its assessments are correlated with the outcomes regarding fitness to drive, the scores are used primarily to identify trends in the driver's performance, such as deficiencies in spatial ability or information processing. Such trends can then be used to formulate appropriate forms of training (Brian Ellison, Mobility Advice and Vehicle Assessment Service, personal communication, June 15, 2005).

DiStefano and MacDonald (2003) advocate a formal method of scoring driving performance but note that if there were only one examiner in the vehicle, it would be difficult for him or her to take on the additional workload of recording driving errors while also directing the driver and maintaining safety. The authors argue that there is a need to balance the occupational health and safety of the examiner with the desirability of detailed driver performance information.

One way of resolving this problem is to have a third party in the vehicle during a PDA to take on the responsibility of scoring the driver's performance, thus leaving the driving instructor with the task of directing the driver through the course and ensuring safety on the test. Fox et al. (1998) add that another advantage of having a third party in the back seat scoring performance is that it is easier to observe the driver's visual scanning behaviour from the back seat. Also, the two examiners in the vehicle could confer after the PDA on the driver's performance, thus providing a validity check on the scores recorded by the examiner in the back seat.

A good example of the combination of a driving instructor and an examiner specifically focused on scoring driving performance is again provided by the Driver Assessment Rehabilitation Service in South Australia. PDAs by this agency would involve a driving instructor in the front passenger seat directing the driver through the course and maintaining

safety, while an OT sat in the back seat to observe and score the driver's performance (Baldock, 2004). The detailed scoring used in assessments by this agency were the product of this combination of driving instructor and OT. An additional benefit of this arrangement was that the specialised knowledge of an OT could be used when observing the driver's performance and when determining the appropriate licensing recommendations. The usefulness of OTs in PDAs has already been documented in section 3.1.1.

The aspect of scoring PDAs that is the most agreed upon is that assessors should focus on errors that indicate a driver is unsafe and has an increased risk of being involved in a crash, while paying less attention to minor errors indicative of the sorts of bad habits common among drivers in general (DiStefano & MacDonald, 2003; Dobbs, 1997; Galski et al., 2000; Lundberg & Hakamies-Blomqvist, 2003; NHTSA, 1999). Most drivers have bad habits, such as rolling over Stop lines, but these should not result in licence cancellation. The loss of a licence should only be related to the occurrence of errors indicative of driving impairment sufficient to indicate a high level of crash risk. This has led to analyses of driving performance in which different error types are categorised according to their relationship to crash risk.

For example, Dobbs (1997) separated errors into three categories. These were 'hazardous' errors, which would result in a crash without intervention from the examiner (e.g. driving the wrong way on a freeway, stopping at a green traffic signal), 'discriminating' errors, which are potentially dangerous errors signifying declining driving skill (e.g. poor positioning on turns, observational and scanning errors), and 'non-discriminating' errors, which are made equally often by good and bad drivers, and which are indicative of bad habits rather than declining ability (e.g. rolled stops at Stop lines). Dobbs specified that hazardous errors would automatically lead to failure, as would too many discriminating errors, but that there would be no penalty applied for non-discriminating errors.

That Dobbs (1997) rated errors requiring intervention from the examiner as the most significant has received support from studies by DiStefano and MacDonald (2002; 2003) in Victoria, Australia. In a study of fitness to drive assessments conducted by Licence Testing Officers, which are similar to South Australia's SEOs, (2002) and also in a study of assessments conducted by Licence Testing Officers in combination with OTs (2003), interventions by the examiner to maintain safety on the test were the most predictive of assessment outcome. In the first study, driving instructor interventions occurred for 270 of the 279 drivers who failed the test and for one of the 254 drivers who passed. Interventions were most common for intersection negotiation manoeuvres. In the second study, no drivers who passed the test required a driving instructor intervention, while interventions were required for 8.5% of those who passed but with conditions and 85.3% of those who failed. The authors argued that driving instructor interventions are "inherently a valid indicator of unsafe driving behaviour - since unsafe behaviour is precisely the criterion of their occurrence", and that their use in scoring was supported by their occurrence typically in situations where older drivers are more likely to crash (intersections) and the significant associations between driving instructor interventions and overall error rates. However, they cautioned that scoring criteria need to be more highly specified than is feasible with driving instructor interventions. It would be difficult to specify levels of crash risk on a test that would justify an intervention, and other errors not requiring an intervention are also likely to be of clinical importance (DiStefano & MacDonald, 2003).

Some studies have been conducted in which attempts have been made to develop weighted error scores for driving tests, utilising combinations of driving instructor interventions and other error types (Baldock, 2004; Janke & Eberhard, 1998; Staplin et al., 1998). In Baldock's study (2004), which used the results of driving assessments by the Driver Assessment Rehabilitation Service, the weighted error score was based on 10 times the number of driving instructor interventions, plus five times the number of 'hazardous' errors (types of errors such as unsafe gap acceptance and inappropriate speed that would be likely to lead to crash occurrence), plus the number of 'habitual' errors (errors such as failed mirror checks and failure to indicate, that represent bad habits). This weighted error score correctly classified 94% of drivers according to the overall pass/fail judgements made

by the assessors (an OT and driving instructor). The studies by Staplin et al. (1998) and Janke and Eberhard (1998) both used a weighted error score based on three times the number of 'critical' errors plus five times the number of 'hazardous' errors plus other errors. In these studies, critical errors were errors that would normally lead automatically to test failure, while hazardous errors were a subset of critical errors that were dangerous enough to require intervention from the examiner. These critical and hazardous errors seem to correspond with Baldock's hazardous errors and driving instructor interventions, respectively.

The use of weighted error scores in research has been found to be useful but, for making clinical judgements regarding fitness to drive, such scores could only function as a guide. Whether a driver requires lessons, or should forfeit his or her licence, or should be allowed to continue driving will depend, not solely on the errors made on the test, but also on knowledge regarding their medical conditions. For example, different decisions may be made regarding someone recovering from a stroke, compared to someone affected by a progressive condition such as dementia. As noted in section 3.1.1, such considerations require the expertise of a practitioner with background medical knowledge, such as an OT.

3.4.2 South Australian practice

Recording of driver performance in a PDA is done by the SEO immediately after the test is completed. Notes on driving performance are very rarely written during the assessment because the assessor has to keep his or her eyes on the road. Therefore, the recording of performance on the test is done almost entirely from memory.

A detailed scoring form is available for PDAs. The form is divided into sections according to the general tasks being assessed, with spaces provided to record penalty points for different types of driver errors. Penalty points can be counted according to the number of times specific errors are made, with higher numbers of points for more significant errors. For example, riding the clutch attracts a single point penalty, while a two point penalty is associated with failing to keep a safe distance from preceding vehicles.

However, this scoring form is not used. This is because, as previously noted, the assessor is unable to record errors while also watching the road and directing the driver, and it would be too difficult to remember and record all of the errors the driver made. SEOs are encouraged, however, to record any interventions (either verbal or physical) on their behalf to ensure safety on the test, and also the nature of the interventions (e.g. applied brake, grabbed steering wheel).

The paperwork to be filled in by the SEO for the PDA includes sections concerned with the closed course assessment (i.e. the drive in the centre car park) and the on-road assessment. For the latter, the SEO can either record that no major errors or breaches of the road rules were noted, or that the drive was safe and only minor errors were observed, or that several significant errors were noted. For the latter designation, a section is provided for a written account of the errors made by the driver.

3.5 Licence recommendations

3.5.1 Literature

Wang et al. (2003) provide a list of the possible types of recommendations that could be made after a driver has completed an on-road evaluation of their fitness to drive. Drivers could: return to driving with or without adaptive equipment, return to driving but with restrictions placed on either the geographic area or conditions in which driving can be done (e.g. no night driving), attend a remedial driving course to establish or maintain their defensive driving skills, receive instruction in driving with new adaptive equipment fitted to their vehicle, or cease driving and review alternative transportation options. Drivers may also be recommended to follow one of these options but also be recommended to undergo a re-

evaluation at a later date, either to assess possible improvement in performance after lessons or adaptation to new vehicular equipment, or to assess declines in performance likely to result from a progressive condition, such as dementia, with which the driver has been diagnosed (Wang et al., 2003).

There is a sizeable range of adaptive equipment that can be fitted to a vehicle to enable safe driving for functionally impaired adults. Available equipment includes: a range of hand controls (for when the functioning of the driver's legs is impaired), electronic accelerator and brake systems, left foot accelerators, hand brake and gear selector modifications, special mirrors (useful to compensate for declines in vision or in range of head/neck movement), horizontal and joystick steering, personal hoists, swivel seats, and wheelchair stowage (Brown, 2003).

It is important, when making licensing recommendations, that assessors are cognisant of the negative effects that loss of a licence are known to have on an older adult. Driver's licences are seen by older adults as important for independence and convenience (Burns, 1999), while the loss of a licence has been linked in older adults to decreases in out-of-home activities (Marottoli et al., 2000) and an increased likelihood of depression (Fonda, Wallace, & Herzog, 2001; Marottoli et al., 1997).

Given the substantial negative effects that could occur following licence cancellation, assessors must only recommend the loss of driving privileges for drivers with a clearly increased risk of being in a crash. O'Neill (2002, p114) notes that the literature concerned with medical fitness to drive places an "over emphasis on selecting those who should not drive rather than on enabling older drivers". He suggests that if an older driver is identified as impaired in an assessment procedure, the focus should always be on formulating methods of possible rehabilitation.

Brouwer, Withaar, Tant and van Zomeren (2002) also advocate a focus on rehabilitation, pointing out the high likelihood of false positives if licence cancellation is advocated with too low a degree of specificity. As an example, they calculated that a test with 80% specificity and 80% sensitivity, when applied to a group of 100 drivers of whom 10 were not fit to drive, would correctly identify as unfit 8 drivers (80% of 10) who were indeed unfit to drive but would incorrectly identify as unfit 18 drivers (20% of 90) who were actually fit to drive. The specificity of an on-road driving assessment is not ever going to be known (see section 3.7 for a discussion of the difficulties with evaluation) but Brouwer et al's example demonstrates the importance of being cautious about licence cancellation. It should be advocated only when other options are not going to assist the person to drive safely.

3.5.2 South Australian practice

A wide variety of recommendations for the licensure of the driver can be made by the SEOs. The recommendations can include the following:

- the licence to remain suspended
- the driver to have to undertake training with adaptive equipment fitted to the vehicle
- licence suspended but driver able to drive with driving instructor or fully licensed driver
- licence to be up- or downgraded (e.g. from heavy vehicle to car only or vice versa)
- licence to be renewed (if expired) or re-issued (if suspended) with certain restrictions (see below for details of possible restrictions)
- licence renewed
- licence renewed but re-assessment to occur in due course, with driver often advised to seek driving tuition prior to re-assessment.

Licence restrictions can take a number of different forms. Drivers may be restricted in the geographical area in which they are allowed to drive. For example, a driver may only be allowed to drive within the radius of a few kilometres from his or her home, or, if living in a

regional area, may only be allowed to drive within his or her township. Drivers may be restricted in terms of the type of vehicle that they are permitted to drive. Examples include only vehicles fitted with power steering, or only vehicles using an automatic transmission. Such recommendations require a medical justification, such as physical or cognitive problems that preclude driving vehicles without these characteristics. For example, a driver suffering cognitive deficits following a cerebrovascular accident may not have the resources to concentrate on the driving task while simultaneously operating a manual transmission. An automatic transmission may simplify the driving task sufficiently so that they can allocate more of their resources toward maintaining safety. Restrictions to daytime driving only must be based on the advice of medical practitioners because PDAs are always conducted during the daytime, thus meaning that night time driving performance is never evaluated.

With regard to driving lessons, drivers may be *advised* to have them or told that they *must* have them. For some drivers, lessons may be beneficial but, for others, lessons may be unlikely to improve driving performance. The latter may be the case, for example, for drivers with dementing illnesses that affect learning ability. Any costs for driving lessons are incurred by the driver.

Vehicle modifications can also take a number of different forms. These include modification or repositioning of equipment (brakes, accelerator, indicator), the addition of a spinner knob to the steering wheel, or the conversion of foot pedals to hand controls. The driver would then need to have lessons to learn how to use the vehicle modifications, prior to a PDA to determine their fitness to drive with the modifications. The period of training in the use of the vehicle modifications is usually the first time that an OT is involved in the process, although there are occasions when the SEO will recommend an assessment by an OT to determine which vehicle modifications are necessary.

3.6 Post-assessment

3.6.1 Literature

A common component of fitness to drive evaluations is the provision of counselling and advice to drivers, when necessary, at the completion of the assessment. Counselling is of particular importance for drivers whose licence is to be cancelled, given the significance often attached to a driver's licence and the negative effects of licence cancellation mentioned in Section 3.5. A survey of practices by NHTSA (1999) found the provision of counselling to be characteristic of high quality agencies assessing fitness to drive. Counselling is provided to drivers in Ohio, Pennsylvania, at Bryn Mawr Hospital in Pennsylvania, at the UAB Health System in Alabama, and at the Beth Israel Deaconess Medical Centre in Massachusetts. The counselling provided does not merely entail emotional support. The counselling also includes information about the use of alternative transportation options, and can also include discussions about alternative housing choices (e.g. Ohio) (NHTSA, 1999). Wang et al. (2003) does caution, however, that counselling after an on-road assessment does not preclude the need for follow-up counselling from the driver's physician. The driver, if upset when first told that their licence is to be cancelled, may have trouble absorbing information about alternative transportation and so this information may need to be reinforced in a follow-up session.

It has also been claimed that it is ideal if drivers in need of adaptive equipment for their vehicles are given help with this by the fitness to drive assessors. Wang et al. (2003) even suggested that it is ideal if the driver rehabilitation specialist who assessed the driver is the specialist responsible for providing the rehabilitation. Thus, the specialist could prescribe the use of a particular piece of adaptive equipment and then train the driver in its use.

3.6.2 South Australian practice

After the completion of the PDA, the SEO sits with the driver and the driver's support person, and talks about the driver's performance on the PDA. Problems with driving

detected during the PDA are identified and discussed, and the driver is informed of the outcome of the assessment. This process usually takes approximately ten minutes.

Due to time constraints, discussions about alternative transport are very rarely held with drivers whose licence is cancelled. Instead, they are given a brochure. No counselling is provided by the SEO either, due to their lack of training in the provision of such services. The Clinical Management Co-ordinator, an OT, does provide counselling to some drivers, usually drivers affected by neurological or cognitive impairment but sometimes drivers with psychiatric problems or exhibiting anger or anxiety. Most drivers whose licence is cancelled are advised to re-contact their medical practitioner for information regarding support services. Drivers requiring vehicle modifications are not directed to companies that manufacture and supply the necessary equipment. Instead, drivers are advised to look in the telephone directory. The testing agency does not direct the driver to private companies because it is part of a government department. However, an information sheet about the vehicle modification process is currently being prepared by the Clinical Management Co-ordinator.

3.7 A note on evaluation of fitness to drive assessments

Before drawing conclusions about best practice in PDAs, it is necessary to briefly discuss the lack of evaluations of the success of such assessments. As noted by Fox et al. (1998), there is no systematic review available of the validity of on-road testing for assessment of fitness to drive. Galski et al. (2000) go further, arguing that on-road testing can be criticised for its lack of objectivity and reliability, as demonstrated by the high crash rates of young drivers after having passed an on-road test. This, however, ignores the fact that on-road tests can only assess a person's driving *ability* but can tell little about a person's driving *behaviour*. In a fitness to drive evaluation, you are interested in finding out whether a person is *capable* of driving safely but you cannot tell whether they will always *choose* to drive safely. As Fox et al. (1998) note, clinicians must decide whether a patient is able to drive but cannot guarantee that the driver will always be safe or will always use their abilities in an optimal manner.

The lack of evaluations of the validity of on-road fitness to drive assessments is due to the methodological difficulties of conducting such evaluations. On-road assessments do have very high 'face validity' (Brown, 2003; DiStefano & MacDonald, 2002) but other forms of validity and reliability are more difficult to determine. Internal reliability (the extent to which different people assessing the same driver arrive at the same conclusion) can be assessed periodically by having peer review of assessors (i.e. a second driving test performance evaluator in the vehicle also scoring the driver). Test-retest reliability would be difficult to evaluate. Usually when a second assessment is carried out on the same driver, a period of time has passed in which the driver may have recovered from a medical condition (e.g. stroke) or have deteriorated because of a progressive medical condition (e.g. dementia) or have improved through driver training. To properly assess test-retest reliability, volunteers would be needed to undertake an assessment twice in a short period of time. With regard to predictive validity (the ability of the assessment to predict future behaviour, in this case crash rates), its evaluation is made impossible by the fact that drivers adjudged to have an elevated risk of crashing lose their licence and so no longer have an opportunity to crash (Brown, 2003).

For these reasons, the best practice review of PDAs is not able to be strengthened with evidence of the validity of the procedures described. The nature of the outcomes of the assessments (possible loss of licence) precludes the appropriate evaluation of the correctness of the assessments (whether those losing their licences would have been more likely to subsequently crash than those allowed to keep their licences). Nonetheless, the literature reviewed in this report has been produced by those with considerable expertise in conducting driving assessments and working with functionally impaired drivers, and so represents the best information available for informing South Australian practice.

4 Conclusions

The appearance of literature pertaining to the use of practical driving tests in the assessment of medical fitness to drive is a relatively recent phenomenon. Despite this, the literature is sufficient to provide some guidance to practitioners seeking to design practical driving assessments (PDAs) that will reliably identify unsafe drivers. The preceding review of the literature published prior to 2006 and of South Australian practices has revealed a number of ways in which the latter could be improved to better approximate the methods recommended in the literature.

One of the main recommendations from the literature that could be implemented in South Australia is a greater role for occupational therapists (OTs) in the conduct of the PDAs. OTs have considerable expertise in the identification and evaluation of functional deficits and are well placed to determine the likely capability of drivers to compensate for their impairments. OTs should accompany the Safety Education Officers (SEOs) during PDAs so that they can observe the performance of the drivers referred for assessment and evaluate their capacity to benefit from retraining or adaptive equipment, bearing in mind the likely course of the condition(s) causing their deficits in functioning.

The presence of OTs in the car during PDAs will also be of benefit to the implementation of detailed, standardised scoring procedures. The most important objective of SEOs during an on-road test is to maintain the safety of themselves, the driver being evaluated, and other road users. Their ability to maintain safety would be considerably enhanced by no longer having to be responsible for scoring the driver's performance, while the OT, who does not have to concentrate on the maintenance of safety, would be able to record very detailed notes on the driver's behaviour during the test. It is important, however, that members of a multidisciplinary team respect each other's roles and responsibilities.

The use of OTs in PDAs also provides the opportunity for the greater use of pre-on-road assessments. An interview with the driver can yield important information regarding the role that driving plays in their life and the degree of insight they have into the reasons for their referral. The degree of insight is a good indicator of the driver's likely ability for self-monitoring and adherence to restricted licence conditions. Observations of driving performance by the OT can also be guided by the results of pre-on-road testing of sensory, physical and cognitive abilities. The nature of functional deficits identified by standard 'laboratory' tests provide a useful guide for which aspects of driving performance are likely to be problematic for the driver. Given this information, the OT can then focus on these aspects of performance and assess the degree to which the driver is able to compensate for their deficits.

PDAs should also be conducted in dual controlled vehicles, rather than the vehicle normally driven by the driver being assessed. The main reason for this is one of safety. In a dual controlled car, the SEO would be better able to ensure safety on the test. The use of the same car for all PDAs would also aid the standardisation of the assessments. Without standard vehicles, drivers may be at an advantage or disadvantage according to the quality of the car they own. It is essential, however, that the standard vehicle used in a PDA matches the vehicle normally driven by the driver according to whether it is fitted with an automatic or manual transmission. The use of a vehicle unfamiliar to the driver also necessitates that a period of driving in a safe environment (e.g. closed course, car park) is set aside prior to the test so that the driver can familiarise themselves with the standard vehicle provided by the testing agency.

Another way in which South Australian practice could be improved is by requiring more lengthy on-road evaluations. The public road component of PDAs in South Australia lasts for 25 minutes, compared to an average reported in the literature of 45 minutes, and a recommendation from a focus group of OTs of one hour. PDAs need to be long enough to provide a sizeable sample of driving performance and provide multiple opportunities to assess the ability to perform the same driving manoeuvres. In South Australia, there is an

allowance for double assessments (50 minutes) in cases for which it is deemed to be beneficial but it would be ideal if all assessments were this long. However, South Australian PDAs are consistent with the recommendations provided in the literature that tests should be based on standardised routes and set manoeuvres.

The scoring system available for use in South Australia is appropriately detailed but the inability of the SEO to take notes during the drive precludes the use of the scoring protocol. The presence of an OT in the back seat would make it possible to record detailed notes on the driver's performance that would enhance the reliability of the tests and aid in communicating and explaining the test outcomes to the drivers. However, South Australian practice is consistent with the recommendations in the literature for extra weighting to be given in the tests to more serious driving errors, while habitual errors that do not greatly increase crash risk receive less attention. The strong emphasis given to driving instructor interventions in South Australian PDAs is also consistent with the literature.

PDAs in South Australia can lead to a wide variety of different licence recommendations. The availability of a variety of options is consistent with the literature, and with the ideal of promoting the continued mobility of older drivers. The further involvement of an OT in the process of evaluating the driver and formulating recommendations would be of considerable benefit in enabling mobility for drivers affected by functional deficits for which adaptation and compensation are possible.

South Australian practice could be improved with regard to the follow-up discussions with drivers having their driving assessed. Greater assistance could be provided with the purchase and fitting of adaptive equipment, although the current preparation of an information brochure is a step in the right direction. The provision of immediate counselling and information regarding alternative transport options for *all* drivers whose licences are cancelled would also be an improvement, although it should be recognised that follow-up counselling from the driver's general practitioner or a social worker may be necessary as well. The loss of a licence can be a distressing experience for older drivers, many of whom rely on driving for their independence and mobility, and so counselling should be provided as soon as the driver is informed of the licence cancellation decision. The implementation of pre-on-road interviews and functional testing, and presence of an OT in the vehicle during the PDA, would also provide a better basis for post-assessment counselling from the OT. The OT would have a better idea of how the driver performed during the test and the driver would be more familiar with the OT.

Finally, it must be recognised that the recommendations in the literature are not based on best practice determined by assessments of the validity of on-road driving tests. The validity of these tests is not able to be examined because of the lack of opportunity for those whose licence has been cancelled to be involved in crashes that would justify their categorisation as unfit to drive. However, an assessment of the post-PDA experience of drivers allowed to continue driving but with adaptive equipment or restricted licences would be a useful area for future research. If the decisions by the assessors were appropriate, these drivers should not have more crashes than drivers who are allowed to continue driving without restrictions.

Practical driving assessments to determine medical fitness to drive are a relatively new field of practice. Much improvement in methods and expertise can be expected in the years to come. Specifically, further experience in the conduct of such assessments and further research can both be expected to lead to improvements in PDAs in the future. Nonetheless, experience so far has suggested a number of components that characterise equitable practical driving assessments. In South Australia, many of these components are already in place. However, there is still considerable scope for PDAs in South Australia to be updated to better represent current thinking on the best methods for assessing fitness to drive.

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