

This is an Open Access document downloaded from ORCA, Cardiff University's institutional repository:<https://orca.cardiff.ac.uk/id/eprint/100809/>

This is the author's version of a work that was submitted to / accepted for publication.

Citation for final published version:

Handley, Joel D, Thomas, Rhys Huw , McKenna, Pat and Hughes, Thomas A. T. 2017. On the road again: assessing driving ability in patients with neurological conditions. *Practical Neurology* 17 (3) 10.1136/practneurol-2017-001601

Publishers page: <http://dx.doi.org/10.1136/practneurol-2017-001601>

Please note:

Changes made as a result of publishing processes such as copy-editing, formatting and page numbers may not be reflected in this version. For the definitive version of this publication, please refer to the published source. You are advised to consult the publisher's version if you wish to cite this paper.

This version is being made available in accordance with publisher policies. See <http://orca.cf.ac.uk/policies.html> for usage policies. Copyright and moral rights for publications made available in ORCA are retained by the copyright holders.



On the road again: assessing driving ability in patients with neurological conditions

Joel D Handley¹, Rhys H Thomas^{1,2}, Pat McKenna³, Thomas AT Hughes¹

Institutions

1. Department of Neurosciences, University Hospital of Wales, Heath Park, Cardiff, CF14 4XW
2. Division of Psychological Medicine and Clinical Neuroscience, Cardiff University, CF24 4HQ
3. Rookwood Hospital, Fairwater Road, Llandaff, Cardiff, CF5 2YN

Corresponding Author

Joel D Handley

Department of Neurosciences, University Hospital of Wales, Heath Park, Cardiff, CF14 4XW

Telephone: 029 2074 3217 Email: joel.handley@srft.nhs.uk

Key words

Driving Assessment, Rookwood Driving Battery, Adaptations, DVLA, LEAN

On the road again: assessing driving ability in patients with neurological conditions

Joel D Handley, Rhys H Thomas, Pat McKenna, Thomas AT Hughes

Abstract

Many clinicians may not be aware of the specialised methods and adaptations that are used to help people with disabilities to drive a car. We describe a driving assessment process as carried out by one of the country's flagship assessment centres, including an overview of the available assessments, adaptations and relevant legislation, to guide practitioners about how best to appropriately signpost and counsel their patients about driving.

Introduction

Driving helps maintain an individual's independence, including in some cases their employment and roles in family or friendship groups, but unsafe driving has the potential to cause harm. Therefore it is important to approach questions related to driving ability in a systematic and transparent manner to help patients accept the conclusions of health care professionals and to structure the supporting evidence.

As a method for structuring the approach to driving enquiries in a routine clinic we have suggested the 'LEAN model' which considers four questions: the type of *licence* needed (L), his/her *eligibility* to drive according to the DVLA guidelines (E), their *ability* to drive (A), and the lines of accountability regarding the *notification* of appropriate authorities (N).¹

The Driving Centre Assessment

Individuals can be referred for a driving assessment from the Driver and Vehicle Licensing Agency (DVLA), by a family member, by a healthcare professional, or they can self refer. Typically a referral is requested following the diagnosis of, or progression of, a condition that is judged to be compromising driving ability.

The traditional neurological consultation can reliably reach conclusions about an individual's eligibility to drive according to the DVLA guidelines e.g. the time since the last seizure, visual acuity, or visual fields, but if driving ability rather than eligibility is being questioned it suggests that any assessment should include an observation of the person driving; diseases can be diagnosed but abilities have to be tested. The driving assessment at the South Wales Mobility Centre combines both approaches: a comprehensive assessment of physical, visual and cognitive function is combined with an on-road assessment.

The preliminary assessment begins with a structured exploration of medical history, driving habits and relevant functional abilities. This serves to set the scene and allow the examiner to focus their attention on areas of potential concern. This is followed by a basic clinical examination of movements required for driving including hand and foot coordination, neck flexibility and fine finger movement. Next follows a test of basic visual function including acuity, depth perception and visual fields. Lastly, a test of phoria looks for any hidden misalignment of the eyes or strabismus that may only become apparent when binocular viewing is compromised.

After the preliminary assessment, three neuropsychological batteries are used to predict on-road driving ability. The Visual Object and Space Perception battery (VOSP) is used to measure visuo-perceptual ability and includes eight tests of object and space perception. Poor scores on this assessment have been shown to correlate with worse performance in simulated driving scenarios for patients with mild dementia.³ The Behavioural Assessment of the Dysexecutive Syndrome (BADS) assessment battery is used to screen for executive impairments in problem solving, cognitive flexibility and temporal judgement. The Rookwood

Driving Battery is a composite of well established tests including some from the above batteries as well as tests developed specifically for driving assessment. These measure key cognitive functions needed for safe driving including executive and attentional functions, visual object and spatial analysis, praxis skills, and comprehension. It was developed at the South Wales Driving Assessment Centre over a period of 19 years, and for the last 7 of those years validated using real-life, on-road driving performance. A profile score of 10 or more has a positive predictive value of 88% for failing an on-road assessment.²

To observe simulated driving ability a static rig is used to imitate a full range of vehicle controls with an overhead display of visual cues that are used to measure reaction times. A successful response to these cues requires coordinated operation of both the accelerator and brake pedals. However the gold standard for assessing driving behaviour is the on-road assessment. Participants use their own cars, or a dual-control teaching vehicle, to drive along a predetermined route that is representative of everyday driving. The scoring system is based on official DVLA guidelines and places an emphasis on observing overall trends in driving habits rather than listing the number of mistakes and errors witnessed.

The referring source for the assessment is informed of a pass or fail outcome and the driver is legally obliged to inform the DVLA of the result. According to GMC guidance, breaking confidentiality about issues related to driving should only be considered after all efforts to encourage the patient to inform the DVLA have been exhausted; this may include involving relatives, friends or carers when appropriate. A second attempt at this assessment is only permissible in exceptional circumstances e.g. following a marked improvement of symptoms.

Driving Adaptations

An array of driving adaptations is available in driving assessment centres for those drivers who need a physical aid to facilitate manoeuvring a vehicle. The only prerequisite for these devices is an automatic gearbox and most devices are easy to install and detach so that the car can be shared with other drivers.

For those with loss of lower limb function, a push/pull lever device allows control of both the accelerator and brake pedals with just one hand. Trigger accelerators require simple finger flexion and extension to control the speed of the vehicle while ghost ring accelerators use side-to-side finger movements. Rounded ring accelerators fit either over or behind the steering wheel and enable acceleration of the car by pushing or pulling accordingly. If right leg mobility is limited then a left-footed accelerator can be added to the left of the brake pedal. All of these pedals can additionally be extended forwards if the individual has difficulty in reaching them. Lastly a steering wheel ball can be attached to the steering wheel and allows the car to be steered with the movement of just one hand. This adaptation is essential when a handheld acceleration control requires the full attention of the other arm. Remote control devices can be installed for essential car controls such as indicators, windscreen wipers and headlights, which can then be activated using simple thumb movements. These are often cleverly incorporated into the steering ball adaptation to achieve maximum functionality.

The advent of driverless car technology promises enhanced levels of independence for people with disabilities and in the near future Driving Assessment centres may play a key role in identifying those who would benefit from these advances and how best to tailor the vehicle to the individual's needs.

Medical Driving Licences and the DVLA

A specialist team of DVLA doctors, called Medical Advisors, assist medical professionals with queries relating to either an individual driver or fitness to drive in general. UK law states that all drivers with

either a new or a worsening notifiable medical condition must inform the DVLA. The term "notifiable" is used to describe a number of predefined conditions such as epilepsy, cerebrovascular disease, named mental health conditions and some physical disabilities. If the driver decides against surrendering their licence voluntarily then their fitness to drive will be assessed. This may require more information from medical records, in some cases a physical examination, and in some a formal driving assessment. Depending on the outcome of this process, the applicant may then be able to retain their licence indefinitely or for a shorter period of one, two or three years. The most common medically restricted driving licence is for three years. After this time has elapsed the driver's condition is reviewed. Sometimes drivers are told that they must make adaptations to their car followed by another driving assessment. If a licence is revoked, information is then provided about how a reapplication or appeal can be made.

Information about notifiable medical conditions and driver licencing is available in an online guide entitled "Assessing fitness to drive – a guide for medical professionals".⁴ This includes contact details for the DVLA's team of medical advisors who are able to discuss specific cases when required

Summary

This article describes a specialist driving assessment used for individuals whose driving ability is being questioned. The LEAN consultation framework is suggested as a way to help structure preliminary discussions about driving, coupled with close reference to the DVLA guidelines.⁴ A comprehensive driving assessment is recommended for people who are legally eligible to drive but in whom relevant cognitive functions and on-road driving ability need to be formally tested. The Rookwood Driving Battery is a validated test of cognitive functions of particular relevance to driving.

With special thanks to Nathan Edwards (Department of Medical Illustration, University Hospital of Wales), Jeff Botwood and Elizabeth Richmond (South Wales Mobility and Driving Assessment Service).

References

1. Thomas RH, Hughes TA. "Can I drive, doctor?" LEAN thinking may help us answer the question. *Pract Neurol* 2009;9(2):71-8.
2. McKenna PK, Bell V. Fitness to drive following cerebral pathology: The Rookwood driving battery as a tool for predicting on-road driving performance. *J Neuropsychol* 2007;1:1–17.
3. Yamin S, Stinchcombe A, Gagnon S. Driving Competence in Mild Dementia with Lewy Bodies: In Search of Cognitive Predictors Using Driving Simulation. *Int J Alzheimers Dis* 2015;2015:806024
4. DVLA. Assessing fitness to drive – a guide for medical professionals. 2016. Available online at www.gov.uk/DVLA/fitnesstodrive. Accessed 4/1/17.

Figure 1. The off road driving assessment (from left to right)

- 1.1. Static rig simulator
- 1.2. Binocular vision screener

Figure 2. Commonly used driving adaptations (clockwise)

2.1. Above wheel rounded ring accelerator 2.2. Powered swivel seat (for ease of transfer) 2.3. Push/pull lever for both braking and acceleration 2.4. Steering wheel ball with integrated remote control

Figure 3. Comments from Patricia McKenna, author of the Rookwood Driving Battery

The population is rapidly ageing at the same time as driving is becoming more complex given the huge increase in traffic, the complexity of road layouts,, the speed and power of many cars and the competing distractions for the driver, not least gadgetry including technical 'aids' to driving.

There is no discrete line that gets crossed to divide safe/unsafe driving, but a large grey area of incremental risk of accident. This risk is increased by many neurological conditions but also by the ageing process. Medical 'eligibility' criteria is becoming increasingly complex as it tries to capture this reality.

The ageing process spares no-one in incrementally reducing visual and auditory function, fine motor control, speed of information processing and ability to multi-task, all of which present an increased risk to safety on road. McKenna & Bell (2007) found that across all medical conditions, age was an independent factor in increasing the on-road risk score.

Thus not only medical condition but age contributes to increased risk within this gray area. Sometimes, an informal walk round the car can tell a story at odds to that of the patient.

Figure 4. Words of wisdom: Three practical points from two senior driving assessors

On the Road

1. People often feel that they would never be able to continue or resume driving because of a physical limitation but sometimes it can be as simple as switching to an automatic vehicle or a basic adaptation.
2. Although a patient may present well during a clinic when assessed using traditional diagnostic methods their on-road ability may not be up to the standard required for safe driving.
3. Patients referred for a driving assessment should be told that they may not have the necessary skills to drive safely.