Disability and Rehabilitation

ISSN: 0963-8288 (Print) 1464-5165 (Online) Journal homepage: https://www.tandfonline.com/loi/idre20

# Predicting fitness-to-drive following stroke using the Occupational Therapy – Driver Off Road Assessment Battery

Carolyn A. Unsworth, Anne Baker, Natasha Lannin, Priscilla Harries, Janene Strahan & Matthew Browne

**To cite this article:** Carolyn A. Unsworth, Anne Baker, Natasha Lannin, Priscilla Harries, Janene Strahan & Matthew Browne (2019) Predicting fitness-to-drive following stroke using the Occupational Therapy – Driver Off Road Assessment Battery, Disability and Rehabilitation, 41:15, 1797-1802, DOI: 10.1080/09638288.2018.1445784

**To link to this article:** https://doi.org/10.1080/09638288.2018.1445784

DISABILITY AND REHABILITATION
2019, VOL. 41, NO. 15, 1797–1802
https://doi.org/10.1080/09638288.2018.1445784

Taylor & Francis
Taylor & Francis Group

ASSESSMENT PROCEDURE

OPEN ACCESS Check for updates

# Predicting fitness-to-drive following stroke using the Occupational Therapy – Driver Off Road Assessment Battery

Carolyn A. Unsworth[a,b,c], Anne Baker[d], Natasha Lannin[c,e,f], Priscilla Harries[g], Janene Strahan[h] and Matthew Browne[a]

[a]School of Health Medical and Applied Science, Central Queensland University, Bundaberg, Australia; [b]School of Health Sciences, Jonkoping University, Jonkoping, Sweden; [c]College of Science Health and Engineering, La Trobe University, Bundoora, Australia; [d]Department of Occupational Therapy, Australian Catholic University, Melbourne, Australia; [e]Department of Occupational Therapy, Alfred Health, Melbourne, Australia; [f]Rehabilitation Studies Unit, University of Sydney, Sydney, Australia; [g]School of Health Sciences and Social Care, Brunel University London, London, UK; [h]Sunshine Hospital, Melbourne, Australia

**ABSTRACT**

**Introduction:** It is difficult to determine if, or when, individuals with stroke are ready to undergo on-road fitness-to-drive assessment. The Occupational Therapy – Driver Off Road Assessment Battery was developed to determine client suitability to resume driving. The predictive validity of the Battery needs to be verified for people with stroke.

**Aim:** Examine the predictive validity of the Occupational Therapy – Driver Off Road Assessment Battery for on-road performance among people with stroke.

**Method:** Off-road data were collected from 148 people post stroke on the Battery and the outcome of their on-road assessment was recorded as: fit-to-drive or not fit-to-drive.

**Results:** The majority of participants (76%) were able to resume driving. A classification and regression tree (CART) analysis using four subtests (three cognitive and one physical) from the Battery demonstrated an area under the curve (AUC) of 0.8311. Using a threshold of 0.5, the model correctly predicted 98/112 fit-to-drive (87.5%) and 26/36 people not fit-to-drive (72.2%).

**Conclusion:** The three cognitive subtests from the Occupational Therapy – Driver Off Road Assessment Battery and potentially one of the physical tests have good predictive validity for client fitness-to-drive. These tests can be used to screen client suitability for proceeding to an on-road test following stroke.

**➤ IMPLICATIONS FOR REHABILITATION:**

- Following stroke, drivers should be counseled (including consideration of local legislation) concerning return to driving.
- The Occupational Therapy – Driver Off Road Assessment Battery can be used in the clinic to screen people for suitability to undertake on road assessment.
- Scores on four of the Occupational Therapy – Driver Off Road Assessment Battery subtests are predictive of resumption of driving following stroke.

**ARTICLE HISTORY**
Received 25 September 2017
Revised 20 February 2018
Accepted 23 February 2018

**KEYWORDS**
Automobile driving; driver assessment; clinical screening; occupational therapist; cerebrovascular accident

## Introduction

Stroke remains a leading cause of disability among people living in developed nations [1]. Despite many advances in acute medical care and rehabilitation, stroke generally produces lasting skill deficits of a physical, sensory, psychological, and/or cognitive/perceptual nature [2]. These skills are vital to enable performance in a range of activities of everyday living such as driving. Driving is a complex activity requiring the simultaneous integration of a range of cognitive and perceptual-motor behaviors [3]. For example, driving places considerable stress on an individual's attentional systems as it requires the driver to simultaneously process a variety of vital information in a changing environment [4]. The number and severity of impairments that people experience following stroke mean that many people will be required to relinquish driving, and others will simply give up [5].

Cessation of driving can lead to negative consequences such as difficulties with accessing shops, banks, social activities, and health-care services [5,6]. Social isolation, distress, and poorer health have also been directly associated with the cessation of driving post stroke [7]. These themes have been replicated in several subsequent studies, where people who have experienced stroke have reported feeling that their sense of autonomy and control had been compromised once forced to cease driving, and in turn this has negatively impacted their quality of life [8–11]. Therefore, it is important to support people to return to driving following stroke, providing the individual poses the necessary physical, sensory, and cognitive skills.

International guidelines for the resumption of driving following stroke vary widely. In Australia, medical guidelines for fitness to drive [12] state that an individual should not drive for at least

CONTACT Carolyn A. Unsworth c.unsworth@cqu.edu.au CQUniversity, 120 Spencer St., Melbourne, VIC 3000, Australia

4 weeks after a stroke. Similarly, guidelines in the UK mandate that anyone who has experienced a stroke or transient ischemic attack should not drive for 1 month [13]. In the USA, guidelines simply suggest that clients be assessed post stroke by a driver rehabilitation specialist [14]. Internationally, it is generally the case that if the stroke has resulted in significant deficits, then most licensing jurisdictions recommended that return to driving is dependent upon physician assessment or evaluation by a specially trained occupational therapy driver assessor (OTDA). However, with growing numbers of people who have experienced stroke requiring driver assessment, there has been increasing demand for researchers to identify assessments that are predictive of on-road performance, and therefore screen people who are and who are not suitable to progress to this form of assessment [7,15]. While a test has not yet been identified that can accurately replace on-road testing, it seems that assessments that are highly predictive of on-road performance can be used to determine if and when a client is best suited to undergo the more expensive and time consuming on-road test, thus assisting OTDAs to manage waiting lists. Several studies have shown that following stroke, people are often poorly informed about driving assessment and have limited access to dedicated driver assessment and rehabilitation services [5,16,17]. The availability of off-road tests that are predictive of fitness-to-drive could also ensure that people who have experienced stroke are routinely assessed, and informed of their options and responsibilities.

While many individual assessments of cognition, perception, and vision are available for OTDAs to use, the Occupational Therapy – Driver Off Road Assessment (OT-DORA) Battery [18–21] was developed to comprehensively screen a person's strengths and weaknesses, prior to an on-road assessment. The Battery includes an initial Interview, medical history, medication screen, four standardized sensory assessments, four standardized physical assessments, and three standardized cognitive/perceptual assessments. A further six standardized tests can be used if clinically indicated. For example, stroke clients should also be screened for unilateral neglect and the OT-DORA includes the Bell's Test [22] for this purpose. All standardized assessments are included as part of the Battery with permission from the various developers, except for the Mini Mental Status Examination [23] which can be purchased separately. The process of evaluating the psychometric properties of the OT-DORA Battery has begun on both the individual tests [24,25] and the Battery as a whole [19]. Further work is required to validate the use of this Battery and specifically determine its predictive validity with a stroke population.

Despite more than 25 years of research on driver assessment for people with stroke, relatively few studies have examined the predictive factors associated with returning to drive for this group [3,6,7]. Given that 23 million people internationally expected to have a first-time stroke annually by the year of 2030 [26] and that many of these people will want to resume driving, it is vital to identify assessments that can predict on-road driving performance. The aim of this research was to examine the predictive validity of the OT-DORA Battery for on-road driving performance among people following stroke.

## Methods

### Participants

Over two 18-month periods, data were collected from consecutively referred, consenting clients presenting with a stroke to 11 OTDAs working either in a hospital-based driver assessment clinic or in private practice in Melbourne, Australia. In Australia, all clients who have had a stroke must receive medical clearance to resume driving. Therefore, if the stroke has been mild and full return of function achieved, many people are signed off by their physician as being able to resume driving with no further testing required. However, people who experience deficits are either advised to either undergo assessment with an OTDA, or screened and advised to wait for further return of function before proceeding to OTDA assessment. All clients met the licensing authority visual standards to participate in an on-road driving assessment. These were a visual binocular static acuity of 6/12 using a Snellen chart or equivalent and at least a 120-degree binocular visual field [12]. All clients had medical clearance to proceed to participating in OTDA testing. It is important to note that while medical clearance is required in some states (such as the one where this research was conducted) to proceed to driving assessment, this is in no way an indication of the capacity of the client to drive. Rather, it is a statement from a medical practitioner that the client is medically stable and ready to undergo driver evaluation. All OTDAs had over 5-year practice experience in assessing clients in return to driving following stroke. A variety of driving instructors were also involved in the study; however, their role was to ensure the safety of the vehicle and its occupants and they were not directly involved in the fitness-to-drive recommendation which was made by the OTDA.

### Instruments

#### OT-DORA Battery

The OT-DORA Battery was administered with all clients. The sensory screen includes Visual Acuity (Snellen chart or equivalent), Visual Confrontation Test [27], Motor Sequences Screen-Selected [28], and Test of Proprioception – Lower Limb [29,30]. The physical screen includes the Berg Balance Scale (BBS) [31], the Motricity Index (MI) [32], Simulated Accelerator Brake Test (SABT) [33], and Right Heel Pivot Test [34]. As the Right Heel Pivot Test was found to be predictive of return to driving in this research it is briefly described. In this test, the client is asked to pivot the right heel from the right to left side, tapping their toe 15 times in total as they pivot (8 to the right side and 7 to the left). The time taken to perform this test in seconds is recorded). All three cognitive screening tests included in OT-DORA were also found to be predictive of return to driving in this research, and therefore these tests are described in detail. The Road Law Road Craft Test comprises 14 items and scores range from 0 to 37 (with 0: impaired road law knowledge and 37: full road law knowledge) [21]. The Occupational Therapy-Drive Home Maze Test (OT-DHMT) [24,25] is measured in seconds with a lower score indicating a faster/better time through the maze than a higher score, and scores less than 100 s suggesting return to driving is possible across all client groups. Different cut points are under development for different client groups such as clients with stroke, as developed in this paper. The Mini Mental State Examination [23] is scored from 0 to 30, with 0 indicating severe cognitive impairment and 30 suggesting no cognitive impairment. The Mini Mental State Examination is one of the most commonly used assessments to predict return to driving [35]. The OT-DORA Battery can generally be completed in under 90 min.

#### On-road assessment

The on-road assessment was undertaken in a dual controlled test vehicle. A driving instructor was present in the front passenger seat, and was responsible for vehicle safety as well as providing instructions to the client. The OTDA sat diagonally behind the

driver. Drive time ranged from 30 to 90 min, and followed a set route on a public road with a full range of traffic conditions and intersection types. The drivers did not undertake the same test route; however, all drives were comparable in terms of maneuvers required and length of driving time. Given the variability in traffic situations encountered during any given drive, it is not possible to standardize an on-road assessment in the real driving environment. However, each driver's performance was scored in a standard manner at pre-determined points along the route using a checklist. The outcome of the assessment process was classified as: fit-to-drive which included the subcategory of fit-to-drive with conditions (such as driving only during daylight hours, only driving a car with automatic transmission, or driving within a certain radius from home), or not fit-to-drive.

### *Procedure*

Hospital and university ethical approval was sought and gained for the study. The OTDAs consented consecutive clients into the study, and forwarded a copy of the completed OT-DORA Battery and resulting fitness-to-drive recommendation from the on-road assessment to the researchers.

### *Analyses*

Initially, exploratory data techniques were used to describe the sample, and participants were classified as fit-to-drive (including a subcategory of fit-to-drive with conditions) or not fit-to-drive. Analysis was then conducted in the R statistical programing environment [36], utilizing the *rpart* and *caret* [37] packages for CART and cross-validation functionality, respectively. The subtests of the OT-DORA Battery were employed as candidate predictors, with the goal of classifying driving test pass or fail status. The key hyper-parameter of CARTs is the "complexity parameter" (*cp*), which determines the size of tree grown. Too low a value of *cp* will yield an overfit model, and too high a value of *cp* will result in under-fitting. Ten-fold cross-validation was used to select *cp* based on maximizing the area under the curve (AUC) incorporating both sensitivity and specificity.

## Results

Data were collected with 148 clients who had a primary diagnosis of stroke. Demographic information for the sample, mean scores on the physical, and cognitive tests which were found to be predictive of return to driving in the CART analysis, and fitness-to-drive outcomes are presented in Table 1. The majority of participants with stroke ($n = 112$, 76%) were reported as able to resume driving, and 60 (54%) of these were recommended to hold a conditional license. The CART model is presented in Figure 1. The fit-to-drive decision for clients post stroke could be explained by knowledge of the client's total scores for the Road Law Road Craft Test, OT-DHMT, Right Heel Pivot Test, and the Mini Mental State Examination. For example in Figure 1, following the right branch of the tree from node 1, drivers generally pass if their Mini Mental State Examination score is greater than 27.55. Following the left branch to node 2 for drivers who score less than a Mini Mental State Examination score of 27.557, drivers generally fail the on-road assessment if their Road Law Road Craft Test score is also less than 20.5. However, following all the right branches from node 2, it can be seen that drivers with a Road Law Road Craft Test score of over 20.5 generally pass even if their Mini Mental State Examination score is less than 26.975, providing their OT-DHMT is faster (lower) than 33 s. The optimal determined value of *cp* was 0.027. The CART had an associated area under the curve of 0.831. Using a threshold of 0.5, the model correctly predicted 98/112 clients who passed (87.5%) and 26/36 of the clients who failed (72.2%). The final nodes of the tree are based on the smallest subsets of the data. The final split for the Right Heel Pivot Test for slower times was not expected, as it would be expected that faster times would be a better predictor of driving performance. While this issue is explored in the Discussion section, it is of note that the mean score on the Right Heel Pivot Test for the drivers who passed was 7.7 (SD: 2.949) and 6.7 s (SD: 2.667) for those who failed, which was not significantly different (independent samples *t*-test; $t(122) = -1.841$, $p = .068$).

## Discussion

This research examined the off and on-road fitness-to-drive assessment results for a sample of people who have experienced stroke, and the predictive validity of the OT-DORA Battery for on-road performance. It was found that scores on the three cognitive subtests Mini Mental State Examination, Road Law Road Craft Test, OT-DHMT, and potentially the Right Heel Pivot Test could be used in combination to predict driving outcomes. Of the total sample, 60 (41%) were recommended to hold a conditional license such as day time driving only, or driving in a local radius of 5 or 10 km. This supports the notion that OTDA assessment aims to keep people with stroke driving for as long as possible, for those who are safe to do so. These conditions are designed to minimize and manage risk of crash, while supporting and promoting people to be able to access their local community and support people to live at home for as long as possible.

In Australia, medical guidelines state that an individual should not drive for at least 4 weeks after a stroke [12]. In addition, if the stroke has resulted in significant deficits, it is recommended that return to driving is dependent upon physician assessment or

**Table 1.** Sample characteristics and scores on OT-DORA Battery for 148 clients post stroke.

| | Mean or % | SD | Range | *n* |
|---|---|---|---|---|
| Age (years) | 65.36 | 14.72 | 20–95 | 148 |
| Gender | | | | 148 |
| Male | 67.6% | | | 100 |
| Driving experience (years) | 42.74 | 16.20 | 0–83 | 116 |
| RL&RCT (total score) | 29 | 7 | 0–37 | 139 |
| OT-DHMT (s) | 50.8 | 42.9 | 11–275 | 140 |
| MMSE (total score) | 27 | 3 | 20–30 | 59 |
| RHPT (s) | 6.27 | 2.24 | 3–16 | 125 |
| Fit-to-drive (all fit-to-dive with no conditions and with conditions) | 76% | – | – | 112/148 |
| (Fit-to-drive with conditions) | 41% | – | – | 60/148 |
| Not fit-to-drive | 24% | – | – | 36/148 |

RL&RCT: Road Law and Road Craft Test; OT-DHMT: Occupational Therapy Drive Home Maze Test; MMSE: Mini Mental Status Examination; RHPT: Right Heel Pivot Test.

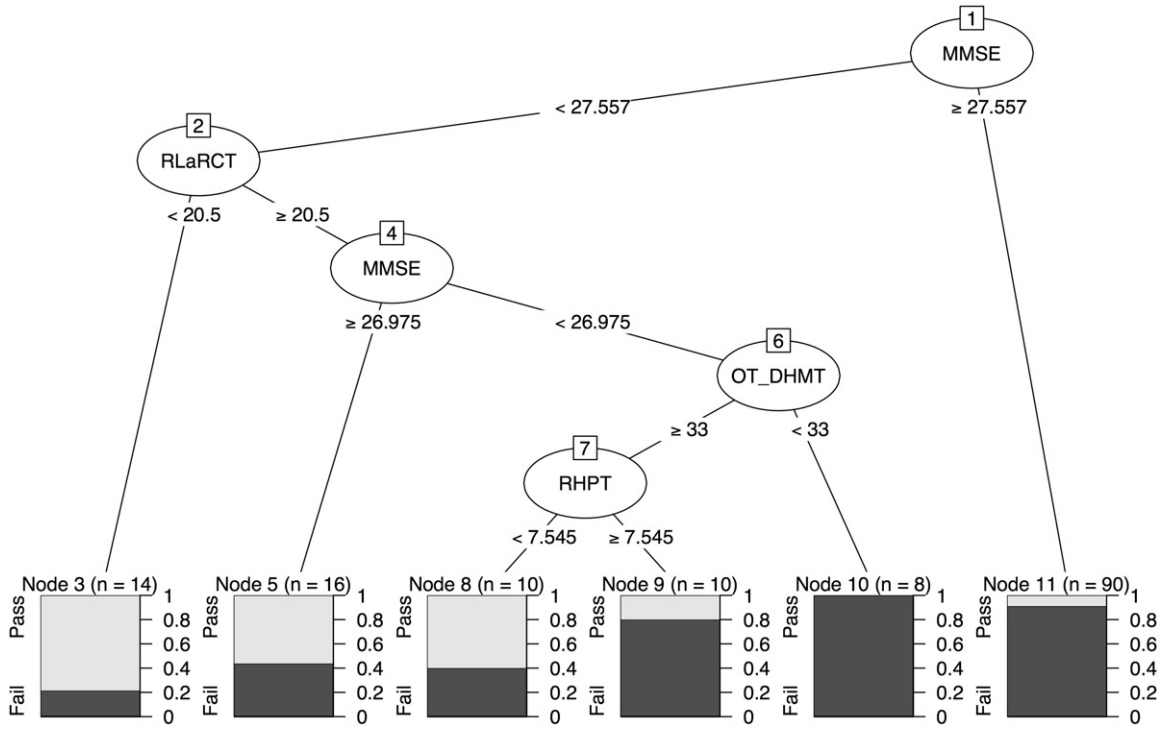


**Figure 1.** Classification and regression tree analysis of fitness-to-drive ($n = 148$). RLaRCT: Road Law and Road Craft Test; OT-DHMT: Occupational Therapy Drive Home Maze Test; MMSE: Mini Mental Status Examination; RHPT: Right Heel Pivot Test.

evaluation by a specially trained OTDA. With an ageing population, and given that increasing age is a risk for stroke [1], a rise in the number of individuals who experience a stroke is expected. This in turn may lead to an increasing reliance on off-road assessments to manage wait lists by determining which clients, or when clients are ready for on-road assessment. It is not our position that these off-road assessments should replace on-road assessments for the majority of clients, but rather that the results from this study could be used to identify the small number of clients who cannot undergo testing, and for others to guide the timing of the driver assessment process. The resumption of activities of daily living post stroke can occur over a long period of time while the person with stroke understands, adapts and compensates for their deficits. Given the finding from this research that most clients will be classified as "not fit-to-drive" if their Mini Mental State Examination score is less than 27.5, their Road Law Road Craft Test score is less than 20.5, and their OT-DHMT is slower (greater) than 33 s, this suggests that the client's driver assessment should be delayed until recovery of skills in these areas is seen. Using these scores from the cognitive screening tests in the OT-DORA Battery could help to facilitate more effective waiting systems for driver assessment services, and save costs for clients who may be unnecessarily assessed on-road at the wrong point in their recovery process.

The findings from the CART analysis also suggested that slower times on the Right Heel Pivot Test may also support an understanding of drivers who are more likely to pass the on-road assessment. This was unusual as it is generally believed that faster times pivoting the heel would be predictive of driving skill. However, as noted in the Results section, the final nodes of the tree are based on the smallest subsets of the data, and therefore this division is based on only 20 clients. Furthermore, the difference in Right Heel Pivot Test for clients who passed and failed the on-road test was not significantly different, suggesting that further research be undertaken on the Right Heel Pivot Test before this subtest be used to support which clients are ready to participate in on-road testing.

In Australia, very limited data are available to describe return to drive rates post stroke. It is possible that the guidelines mandated by Austroads [12] are not always followed, and that clients may decide to continue to drive or refrain from driving based on inadequate information, as has been shown to occur internationally [5,16,17]. Such drivers may not be insured if they are involved in a crash. It is also possible that physicians do not have adequate information when making recommendations and should refer more clients to OTDAs for screening and on-road assessment. Hence, there is a need to further investigate if clients are informed of their responsibilities and obligations concerning resuming driving, and that there is equity in access to specialized services such as occupational therapy driver assessment. Use of appropriate screening tool such as the OT-DORA Battery could help to facilitate this by prioritizing client caseloads. Therefore, the OT-DORA Battery can be used as part of the screening process to identify drivers who are ready to proceed to testing, as well as being used as part of the testing process itself [18].

## Limitations and directions for future research

This research has examined driving outcomes for a relatively small sample of Australian clients presenting for driver assessment post stroke. However, this sample is comparable or larger than many other studies of clients with stroke that include both off-road and on-road testing [3,15]. While the return-to-driving rate of 76% is similar to that of international studies [5,16,17], larger data-sets are required to confirm these results and ensure that the modeling presented holds true with larger sample sizes. In particular, larger samples of clients who fail the on-road assessment are required. It is possible that the return-to-driving rates from the literature and the current study are reflective of conservative screening of people with stroke before they have

the opportunity for assessment with an OTDA. It is possible that people are being advised that they will be unsuccessful and therefore do not even attempt the assessment and rehabilitation process. Stapleton [38] also reported conservative prescreening of drivers following stroke, potentially leading to a lower number of clients progressing to on-road testing than clinically indicated. As noted earlier, giving up driving has many flow-on effects [17], and individuals typically feel that their sense of autonomy and control have been compromised [17,39]. In addition, data were not collected on the type or severity of the stroke experienced by clients in the sample. As all of the sample of clients in this study underwent their driving assessment once they had returned to community living, and any medical referral information was very brief, it was not possible to obtain reliable details of the client's stroke, nor any severity scores that may have been collected. Finally, length of time between stroke onset and client driver assessment was not recorded, since many clients were seen in community settings with no access to client medical records. Length of time from stroke onset to assessment may have varied widely between clients and these data should be monitored in the future.

## Conclusions

Driving has long been identified as a valued activity of daily living for older people [40] and many people who have experienced stroke want to resume to this activity [11]. With the pressure and demand for OTDA services forecasted to rise, it is vital that we establish the predictive validity of off-road assessments, so they can be used to determine the suitability of clients for on-road testing. OTDAs and other driving specialists can use the OT-DORA Battery cognitive tests, and potentially the Right Heel Pivot Test, to guide client suitability for participating in an on-road assessment.

## Acknowledgements

We are grateful to the OTDAs who assisted with data collection, and the clients who consented to being included in the study.

## Disclosure statement

No potential conflict of interest was reported by the authors.

## ORCID

Carolyn A. Unsworth http://orcid.org/0000-0001-6430-2823
Anne Baker http://orcid.org/0000-0002-3779-5463
Natasha Lannin http://orcid.org/0000-0002-2066-8345
Priscilla Harries http://orcid.org/0000-0003-3123-6799
Matthew Browne http://orcid.org/0000-0002-2668-6229

## References

[1] Mendis S. Stroke disability and rehabilitation of stroke: World Health Organisation perspective. Int J Stroke. 2013; 8:3–4.
[2] Jones F, Gage H, Drummond A, et al. Feasibility study of an integrated stroke self-management programme: a cluster-randomised controlled trial. BMJ Open. 2016;6:e008900.
[3] Duquette J, McKinley P, Mazer B, et al. Impact of partial administration of the Cognitive Behavioral Driver's Inventory on concurrent validity for people with brain injury. Am J Occup Ther. 2010;64:279–287.
[4] Stapleton T, Connelly D. Occupational therapy practice in predriving assessment post stroke in the Irish context: findings from a nominal group technique meeting. Top Stroke Rehabil. 2010;17:58–68.
[5] Unsworth CA, Wells Y, Browning C, et al. To continue, modify or relinquish driving: findings from a longitudinal study of healthy ageing. Gerontology. 2007;53:423–431.
[6] Perrier MJ, Korner-Bitensky N, Mayo NE. Patient factors associated with return to driving post stroke: findings from a multicentre cohort study. Arch Phys Med Rehabil. 2010;91:868–873.
[7] Logan PA, Dyas J, Gladman JR. Using an interview study of transport use by people who have had a stroke to inform rehabilitation. Clin Rehabil. 2004;18:703–708.
[8] Almborg AH, Ulander K, Thulin A, et al. Discharge after stroke: important factors for health-related quality of life. J Clin Nurs. 2010;19:2196–2206.
[9] Carod-Artal FJ, Stieven Trizotto D, Ferreira Coral L, et al. Determinants of quality of life in Brazilian stroke survivors. J Neurologic Sci. 2009;284:63–68.
[10] Clarke P, Black SE. Quality of life following stroke: negotiating disability, identity, and resources. J Appl Gerontol. 2005;24:319–336.
[11] White JH, Miller B, Magin P, et al. Access and participation in the community: a prospective qualitative study of driving post-stroke. Disabil Rehabil. 2012;34:831–838.
[12] Austroads. Assessing fitness to drive. Sydney (NSW): Australia; 2012.
[13] DVLA Medical Guidelines. *DVLA's current medical guidelines for professionals – conditions S to U*. [cited 2014 Aug 16]. Available at https://www.gov.uk/current-medical-guidelines-dvla-guidance-for-professionals-conditions-s-to-u15
[14] Carr DB, Schwartzberg JG, Manning L, et al. Physician's guide to assessing and counseling older drivers. 2nd ed. Washington (DC): National Highway Traffic Safety Administration; 2010.
[15] Akinwuntan AE, De Weerdt W, Feys H, et al. The validity of a road test after stroke. Arch Phys Med Rehabil. 2005; 86:421–426.
[16] Fisk GD, Owsley C, Pulley LV. Driving after stroke: driving exposure, advice, and evaluations. Arch Phys Med Rehabil. 1997;78:1338–1345.
[17] Rapport LJ, Hanks RA, Bryer RC. Barriers to driving and community integration after traumatic brain injury. J Head Trauma Rehabil. 2006;21:34–44.
[18] Unsworth CA, Pallant JP, Russell KJ, Odell M. OT–DORA Battery: occupational therapy driver off-road assessment battery. Bethesda (MD): AOTA Press; 2011.
[19] Unsworth CA, Baker A, Taitz C, et al. Development of a standardised Occupational Therapy Driver Off Road Assessment (OT-DORA) battery to assess older and/or functionally impaired drivers. Aust Occup Ther J. 2012;59:23–36.
[20] Unsworth CA, Pallant JF, Russell KJ, et al. Validation of a test of road law and road craft knowledge with older or functionally impaired drivers. Am J Occup Ther. 2010; 64:306–315.
[21] Unsworth CA, Pallant JF, Russell K, et al. Inter-rater reliability of the Road Law and Road Craft test as part of the

OT-DORA batter for off-road driver assessment. Br J Occup Ther. 2011;74:394–339.
[22] Gauthier L, Dehaut F, Joanette Y. The bells test: a quantitative test for visual neglect. Int J Clin Neuropsychol. 1989;11:49–54.
[23] Folstein MF, Folstein SE, Mchugh PR. Mini-mental state: a practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res. 1975;12:189–198.
[24] Krishnasamy C, Unsworth CA. Normative data, preliminary inter rater reliability and predictive validity of the Drive Home Maze Test. Clin Rehabil. 2011; 25:88–95.
[25] Krishnasamy C, Unsworth CA. Validity of the occupational therapy drive home maze test for right and left handed test takers. Accid Anal Prev. 2012;49:274–277.
[26] Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. PLos Med. 2006;3:2011–2030.
[27] Elliot DB, North I, Flanagan J. Confrontation visual field tests. Ophthalm Physiol Opt. 1997;17(Suppl 2):S17–S24.
[28] Smania N, Montagnana B, Faccioli S, et al. Rehabilitation of somatic sensation and related deficit of motor control in patients with pure sensory stroke. Arch Phys Med Rehabil. 2003;84:1692–1697.
[29] Cox JL. Assessing the driving ability of the elderly. Phys Occup Ther Geriatr. 1989;7:144–146.
[30] Cox JL. Elderly drivers' perceptions of their driving abilities compared to their functional motor skills and their actual driving performance. Phys Occup Ther Geriat. 1989;7:51–82.
[31] Berg K, Wood-Dauphinee S, William JI, et al. Measuring balance in the elderly: preliminary development of an instrument. Physiother Canada. 1989;41: 304–311.
[32] Collin C, Wade DT. Assessing motor impairment after stroke: a pilot reliability study. J Neurol Neurosurg Psychiatry. 1990;53:576–579.
[33] Haughton R, Unsworth CA. Development of the simulated brake test. Unpublished Manual. Melbourne: La Trobe University; 2008.
[34] Unsworth CA. Development of the right heel pivot test. Unpublished Manual. Melbourne: La Trobe University; 2008.
[35] Frittelli C, Borghetti D, Iudice G, et al. Effects of Alzheimer's Disease and mild cognitive impairment on driving ability: a controlled clinical study by simulated driving tests. Int J Geriatric Psychiatry. 2009;24:232–238.
[36] R Core Team. R language definition. Vienna, Austria: R Foundation for Statistical Computing; 2000.
[37] Kuhn M. Caret package. J Stat Softw. 2008;28:1–26.
[38] Stapleton T, Connolly D, O'Neill D. Factors influencing the clinical stratification of suitability to drive after stroke: a qualitative study. Occup Ther Health Care. 2015;29: 253–271.
[39] Windsor TD, Anstey KJ, Butterworth P, et al. The role of perceived control in explaining depressive symptoms associated with driving cessation in a longitudinal study. The Gerontologist. 2007;47:215–223.
[40] Fricke J, Unsworth CA. Time use and the importance of instrumental activities of daily living. Aust Occup Ther J. 2001;48:118–131.