



Driver rehabilitation: A systematic review of the types and effectiveness of interventions used by occupational therapists to improve on-road fitness-to-drive

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ABSTRACT

Objective: Driver rehabilitation has the potential to improve on-road safety and is commonly recommended to clients. The aim of this systematic review was to identify what intervention approaches are used by occupational therapists as part of driver rehabilitation programmes, and to determine the effectiveness of these interventions.

Method: Six electronic databases (MEDLINE, CINAHL, PsycInfo, Embase, The Cochrane Library, and OTD-Base) were searched. Two authors independently reviewed studies reporting all types of research designs and for all patient populations, provided the interventions could be administered by occupational therapists. The methodological quality of studies was assessed using the 'Downs and Black Instrument', and the level of evidence for each intervention approach was established using 'Centre for Evidence Based Medicine' criteria.

Results: Sixteen studies were included in the review. The most common type of intervention approach used was computer-based driving simulator training ($n=8$), followed by off-road skill-specific training ($n=4$), and off-road education programmes ($n=3$). Car adaptations/modifications were used in one of the included studies. There was significant variability between studies with regards to frequency, duration, and total number of intervention sessions, and the diagnoses of the participants. Of the four intervention approaches, there is evidence to support the effectiveness of off-road skill-specific training (with older clients), and computer-based driving simulator training (with both older clients and participants with acquired brain injury).

Conclusion: Three types of intervention approaches are commonly reported, however, there is limited evidence to determine to effectiveness of these in improving fitness-to-drive. Further research is required, with clients from a range of diagnostic groups to establish evidence-based interventions and determine their effectiveness in improving these clients' on-road fitness-to-drive.

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1. Introduction

1.1. Background

It has been well established in the literature that driving a car is a meaningful and important activity (Adler and Rottunda, 2006; Bauer et al., 2003; Fricke and Unsworth, 2001; Liddle and McKenna, 2003; Rapport et al., 2006). Driving allows people to access the

world around them. This may include simple and everyday tasks (such as a trip to get groceries from the local shop), as well as larger activities and life goals (such as going away on holidays). Driving is closely associated with the concepts of mobility, independence, and sense of security (Keskinen, 1996; Michon, 1985), and for these reasons, many people will seek to gain their license despite disability, or retain their driver's licence for as long as possible even in the face of illness, injury, or advancing age. An example is provided to demonstrate how a medical condition can affect driving, using The World Health Organisations classification of function (WHO, 2001) as a framework. A medical condition such as atherosclerosis may lead to a cerebrovascular accident, or stroke. This may in turn produce a range of physical, sensory, cognitive, and perceptual impairments. For example, an individual may have difficulty with

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sensorimotor control of the left arm and leg, and may experience left unilateral neglect. These impairments can affect an individual's ability to steer the car, operate the clutch and result in the individual failing to process vital visual and auditory stimuli (such as the presence of other road users, or road signs) on the left side.

In most countries, people who have a health condition that may affect their ability to drive may be required to seek clearance from a licensing jurisdiction to learn, or continue to drive. In these instances, a thorough assessment of the person's off-road and on-road driving skills is required in order to ensure that they are fit-to-drive (Hopewell, 2002). Internationally, occupational therapists are often the health professionals who are trained, and thus invited to undertake fitness-to-drive assessments (Arbesman and Hunt, 2008; Classen et al., 2009; Mazer et al., 2003; Unsworth et al., 2011). Occupational therapists have unique skills in the analysis of task performance and the retraining of activities of daily living, and therefore play a key role in this area (Unsworth, 2007).

The first step in fitness-to-drive assessment involves evaluation by a medical practitioner who ensures that the person meets the appropriate medical standards for driving (Unsworth, 2007). Once medical clearance is provided, assessment of fitness-to-drive by an occupational therapist may occur. Comprehensive driver evaluations (CDE) are considered the 'gold standard' assessment of fitness-to-drive (Classen et al., 2009; Unsworth et al., 2011), and are commonly used by occupational therapists. This involves an off-road and on-road assessment of the client's fitness-to-drive. The outcome from this assessment may be: a pass, fail, or the recommendation of driver rehabilitation. Driver rehabilitation is recommended when there is sufficient evidence to suggest that the client has the potential to pass a subsequent on-road assessment and continue to drive safely, if provided with appropriate intervention (Unsworth, 2007). Occupational therapists are commonly involved in the development and implementation of driver rehabilitation interventions for people who are returning to drive following a health event (Pellerito, 2006; Redepinning, 2006).

Occupational therapists may choose to take a 'top-down' or a 'bottom-up' approach to driver intervention (Arbesman and Hunt, 2008). 'A top-down' or functional approach involves the client practicing the full activity of driving a car, such as completing lessons with a driving instructor. In contrast, the 'bottom-up' or remedial approach involves off-road skill-specific training, such as visual scanning practice. It is currently unclear which intervention approach is most effective. Systematic reviews conducted by Arbesman and Hunt (2008) and Korner-Bitensky et al. (2009) examined the evidence for occupation-based interventions to improve driving ability; however, these reviews were limited to studies involving older people, and included literature from more than 5 years ago. Neither review was able to find conclusive evidence to support particular interventions to improve driving ability. A Cochrane review protocol has also been developed to examine the effectiveness of rehabilitation to improve driving specifically after stroke (George et al., 2010), however this review is not completed and will be limited to stroke. Therefore, occupational therapists currently have limited access to synthesised evidence that can be used to guide their selection of interventions to improve on-road fitness-to-drive and to enable all client groups to safely return to driving.

1.2. Objectives

The primary aim of this systematic review was to identify what types of interventions are used by occupational therapists as part of driver rehabilitation programmes to improve on-road fitness-to-drive. The secondary aim of this review was to determine the effectiveness of these interventions, with respect to on-road fitness-to-drive.

2. Material and methods

2.1. Search strategy

The electronic databases MEDLINE, CINAHL, PsycInfo, Embase, The Cochrane Library, and OTDBase were searched from inception to December 19th, 2012, using the terms *Rehab\$ AND Fit\$ to driv\$ OR Automobile Driv\$*. This search strategy was developed and trialled in MEDLINE (Appendix A), and adapted for use in each of the other electronic databases. Search terms were mapped to medical subject headings (MeSH) terms; however, multiple search terms were not used for key words in order to refine the focus of the citations retrieved. Retrieved citations were downloaded into a bibliographic management software programme (EndNote version X5), and duplicate studies were deleted. Remaining studies were independently screened by title and abstract by the two authors in order to determine their eligibility for inclusion in the review, based on pre-determined inclusion/exclusion criteria. The full text of the article was obtained if further information was required to assist with this decision. Reference lists from all of the included studies were scanned in order to identify any other studies not found in the original search, and on-line citation tracking was also completed for all of the studies that met the inclusion criteria.

2.2. Inclusion criteria

All research designs were included in the systematic review. Single case studies were included since these can contain detailed information on therapy interventions not otherwise provided. Studies had to be published in English in a peer reviewed journal. Opinion pieces, narrative reviews, conference proceedings, and non full-text studies were excluded. Systematic reviews related to a similar topic were excluded unless all of the studies that were included in the original systematic review also meet the inclusion criteria for this systematic review.

2.2.1. Population

- Participants in the study had to hold or have previously held a full drivers licence for private car standards. Studies were excluded if they involved participants who held a commercial, heavy vehicle, or motorbike licence. While it is acknowledged that drivers of these vehicles may be required to undertake a driver rehabilitation programme using similar techniques to those described in this paper, the type and duration of intervention for these drivers is likely to be different when compared with the rehabilitation of drivers of private cars, given the greater complexity of driving a commercial/heavy vehicle (such as managing braking distances and turning spaces), and the solo nature of motorbike riding.
- If participants in the study were un-licensed, the participant had to be aiming to obtain a full drivers licence for private car standards as a result of the intervention they were receiving.

2.2.2. Intervention

- The intervention used in the study had to be aimed at driver rehabilitation, and had to be able to be administered by an occupational therapy driver assessor (OTDA) in clinical practice (even if not done so in the study). OTDAs are specially trained occupational therapists, who have completed an intensive post-graduate training qualification. They are able to administer a range of driver interventions, including computer-based driving simulator training, off-road skill-specific training, off-road education programmes, on-road training and car adaptations/modifications.

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