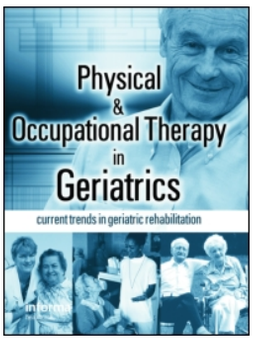

Physical & Occupational Therapy In Geriatrics

ISSN: 0270-3181 (Print) 1541-3152 (Online) Journal homepage: http://www.tandfonline.com/loi/ipog20

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To cite this article: Michael Cammarata, Alexandra S. Mueller, Jocelyn Harris & Brenda Vrkljan (2017) The Role of the Occupational Therapist in Driver Rehabilitation After Stroke, Physical & Occupational Therapy In Geriatrics, 35:1, 20-33, DOI: 10.1080/02703181.2016.1277443

To link to this article: http://dx.doi.org/10.1080/02703181.2016.1277443

Published online: 03 Feb 2017.

PHYSICAL & OCCUPATIONAL THERAPY IN GERIATRICS
2017, VOL. 35, NO. 1, 20–33
http://dx.doi.org/10.1080/02703181.2016.1277443

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The Role of the Occupational Therapist in Driver Rehabilitation After Stroke

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ABSTRACT

Aims: The purpose of this study was to identify and examine the current practices, strengths, and needs of clinicians who provide driver rehabilitation following stroke. *Methods:* In-depth, semi-structured interviews were conducted with occupational therapists from three major stroke rehabilitation hospitals in southwestern Ontario, Canada. *Results:* When determining medical fitness to drive after stroke, clinicians reported using office-based measures to screen physical-motor (e.g., strength, range-of-motion) and cognitive-perceptual abilities (e.g., Trail Making Test A and B). Interventions used to improve readiness to return to driving included a combination of tabletop (e.g., letter scanning worksheet), physical (e.g., throw and catch), and technology-based activities (e.g., driving simulator). *Conclusions:* This study provides information on clinical practices specific to driving rehabilitation after stroke. Results highlight the need for standardizing office-based approaches for assessment and determining interventions based on the best available evidence that reflects the skills needed for driving.

ARTICLE HISTORY
Received 18 January 2016
Accepted 21 December 2016

KEYWORDS
Driving; stroke; occupational therapy; screening; intervention; rehabilitation

A stroke is a major medical event resulting in impairments that can impact a person's ability to perform everyday activities, such as driving. Regaining a driver's license has been identified as critical for the successful re-integration of stroke survivors back into their homes and communities (Finestone et al., 2009; Wood, Connelly, and Maly, 2010). Likewise, a loss in driving privileges is associated with depression, reduced autonomy, decline in social ties, and decreased participation in valued life roles (Logan, Dyas, & Gladman, 2004; Marottoli et al., 1997; Motta, Lee, and Falkmer, 2014). Underlying functional and residual deficits, as opposed to the stroke diagnosis *per se*, are important factors to consider when determining medical fitness to drive. Depending on the nature and severity of the residual deficits, a stroke survivor may have the potential to return to driving; however, to accomplish this goal, individuals must be properly assessed and, when necessary, interventions ought to be administered that are tailored to post-stroke recovery. Although occupational therapists (OTs) have been identified as having a key role in driving

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rehabilitation after impairment (Korner-Bitensky, Bitensky, Sofer, Man-Son-Hing, and Gelinas, 2006), little is known to date about the practices employed by clinicians in rehabilitation settings that address the goal of returning to driving after stroke.

Decision protocols with respect to returning to driving have been established by the Canadian stroke best practice recommendations to help guide clinical practice (Dawson, 2013). These guidelines stipulate that patients should be told by physicians to stop driving for at least one month after a stroke event [Evidence Level C], after which they should be screened for residual sensory, motor, and cognitive deficits [Level B]. In addition, if deemed appropriate, patients should undergo a specialized assessment of off- and on-road skills, which is generally referred to as a comprehensive driving evaluation (CDE) [Level B]. A CDE is often, but not always, conducted by a specially trained OT at a designated driver rehabilitation center. In Canada, a CDE can take upward of 3 hours to administer and patients are usually required to pay out-of-pocket for this service. The average cost of a CDE is $366 (CAD), although the cost can range from $40 to $985 (Vrkljan, Myers, Crizzle, Blanchard, and Marshall, 2013). Given the costs and resources involved, it is important to determine whether the patient in question is in fact ready to undergo a CDE. Determining a persons' readiness to undergo a CDE is an important role for rehabilitation professionals, including OTs. Hence, for clinicians who are responsible for addressing the issue of driving as part of their stroke patient's care plan, it is critical to select the best office-based measures to make this determination and, where appropriate, administer tailored interventions specific to driver rehabilitation.

Use of objective measures is important, as past research indicates that health care professionals can overestimate driving abilities after stroke based on clinical observation only (Nouri and Lincoln, 1993). However, the evidence is mixed as to which objective measures best predict driving abilities after a stroke. A systematic review conducted by Marshall et al. (2007) indicated the strongest office-based measures for predicting on-road performance after stroke were the Trail Making Tests (TMT) A and B (Reitan, 1992), the Rey–Osterreith Complex Figure Design (Rey, 1959), and the Useful Field of View (UFOV) Test (Ball, Beard, Roenker, Miller, and Griggs, 1988). These measures address both cognitive and perceptual-based functions. However, Marshall et al. were unable to report cut-off scores due to a lack of congruency across the selected outcomes of the individual studies (i.e., on-road performance and voluntary driving cessation). In contrast, a systematic review and meta-analysis by Devos et al. (2011) defined cut-off values for other measures specific to failing an on-road evaluation after stroke. Specifically, scores below 8.5 points on the Road Sign Recognition test (Lincoln, Radford, and Nouri, 2004), below 25 points on the Compass test (Lincoln et al., 2004), and slower than 90 s for TMT B correctly predicted individuals as failing an on-road test with an accuracy of 84%, 85%, and 80%, respectively. Although the Road Sign Recognition and Compass tests are subtests of the Stroke Driver Screening Assessment (SDSA; Lincoln et al., 2004), Devos et al. reported that the SDSA, as a whole, has weaker predictive power than when the Compass and Road Sign Recognition components are administered independently.

As part of their review, Marshall et al. (2007) proposed the use of a theoretical model of driving behavior to serve as a guide for selecting appropriate measures to assess driving ability. Michon's (1985) hierarchical model of behind-the-wheel behavior has emerged as a key theory to understanding the underlying skills necessary for driving after brain injury. This model divides the activity of driving into three interdependent, but hierarchical levels that operate concurrently. At the *strategic* (highest) level behavioral decisions are made based on judgment, insight, and experience that can broadly shape driving performance, such as choosing whether or not to drink alcohol prior to driving, or to drive slower because of poor weather. In turn, the driver's behavior can influence the *tactical* level, which refers to how the driver processes the moment-to-moment context of the immediate traffic environment and makes appropriate decisions (e.g., the cognitive-perceptual skills required to recognize and select an appropriate reaction to a vehicle ahead suddenly braking). At the third (lowest) *operational* level, motor output is often generated based on the previous two levels. At this level, the physical actions required to control the vehicle, such as coordination of an upper extremity to steer and/or dorsiflexion of the ankle to initiate braking, are determined. Theoretical grounding for driving rehabilitation is important to ensure that the skills and behavior necessary to safely operate a vehicle are considered during both the assessment and intervention of the patient. The use of a theoretical framework to guide clinical practice is particularly relevant in the context of stroke, as individuals can exhibit impairments at any or all levels identified in Michon's hierarchical model.

Subsequent interventions aimed at preparing a stroke survivor for on-road testing or eventual return to driving are also imperative. Two main intervention approaches to driver rehabilitation following stroke were identified in a recent Cochrane review: (1) component-based and (2) task-based interventions (George, Crotty, Gelinas, and Devos, 2014). A component-based, or bottom-up, approach focuses on improving specific underlying deficits, such as visual processing, whereas a task-based, or top-down, approach involves the use of task-oriented, contextual-based interventions. George et al. identified three studies that employed a component-based approach, but noted a lack of substantive evidence to support the effectiveness of this approach to improve driving performance behind the wheel. However, while actual on-road practice would be the most direct implementation of a task-based intervention, it is not recommended due to the risks involved. Consequently, driving simulators have emerged as a viable alternative to approximate the task of driving in a controlled environment. Although George et al. reported that there is empirical support to suggest that the use of a simulator through task-based intervention improves visuocognitive skills related to driving, there is no clear evidence indicating simulator performance translates to on-road performance for stroke survivors. Given the limited evidence supporting effective interventions to help people with stroke address their goal of returning to driving, the question remains as to what types of interventions are currently being employed in clinical practice.

At present, 19–30% of stroke survivors successfully return to driving after 6 months (Allen, Halbert, and Huang, 2007; Aufman, Bland, Barco, Carr, and Lang,

2013), even though over 50% of patients prioritize driving as the most important goal in their recovery (Logan et al., 2004). The disparity between the low return-to-driving success rate and its high clinical importance indicates a strong need to understand the assessment and intervention practices that are being used during stroke rehabilitation. The purpose of the present study is to identify current assessment and intervention practices employed by clinicians when it comes to returning to driving after stroke. Results from this study will be contextualized using Michon's (1985) model of driving behavior as well as available evidence that supports clinical practice in stroke rehabilitation.

Methods

A questionnaire on the assessment and intervention approaches used to address the issue of driving after stroke was administered to OTs. Research ethics approval for the study was obtained from the University Research Ethics Board, as well as from each clinical site.

Survey questionnaire

The questionnaire developed for the current study was based on a previous survey conducted by Korner-Bitentensky et al. (2010) involving Canadian OTs who worked with older clientele across the care continuum (i.e., in acute, inpatient, and community settings). The primary focus of their survey, however, was on capacity-building needs of therapists in the context of the older driving population, as opposed to practice protocols *per se*. As such, their survey used Likert-scale and closed-ended question formats. We found a similar trend in the methods employed in other survey designs (i.e., closed-ended, Likert-scale ratings) specific to the field of driver rehabilitation (Dickerson and Bedard, 2014; Vrkljan et al., 2013). However, an open-ended response format was chosen for the current study to provide more flexibility with regard to capturing in-depth and accurate responses. We also avoided naming (i.e., listing) any assessment measures or potential interventions to prevent potential response bias (i.e., in which respondents indicate using a measure that they do not actually use in their clinical practice).

A total of four experts, including researchers in stroke, gerontology (specializing in neurological issues), and driver rehabilitation, as well as an OT with over 5 years of frontline experience with this population, developed the questionnaire. The questionnaire was organized to collect information on how the issue of returning to driving is addressed in the context of stroke recovery, starting from the point of referral to the assessment, intervention, and discharge process in inpatient and outpatient hospital-based settings. The questionnaire asked respondents to name specific measures as well as any other strategies or resources they used. Questions also addressed the perspectives of therapists with regard to particular areas, where they felt there were gaps in practice in terms of returning to driving (i.e., recommendations for improvement). Finally, the questionnaire also captured demographic information of respondents. Prior to recruitment, the questionnaire was pilot tested with two

OTs who work in stroke rehabilitation. Minor modifications were made to clarify questions based on their feedback, and the pilot data indicated that the questionnaire was easy to complete and appropriate in length.

Participants

A short email introducing the purpose of the study was sent to clinical managers who worked at three major stroke rehabilitation hospital centers. The managers were asked to provide the names and email addresses of OTs that provided stroke care at their facility. A letter that detailed the purpose of the study, including consent, was then emailed to each clinician. Of the 20 OTs that were identified and contacted to participate, a total of 14 provided consent and completed the questionnaire.

Data collection and analyses

Each questionnaire was administered by the same researcher by telephone, or face-to-face where possible ($n = 10$), using a semi-structured script. All verbal responses to the questionnaire were transcribed verbatim. Four respondents were unable to participate in an interview. These respondents were administered the questionnaire by email and, as such, they provided written responses to each question. Once identifying information had been removed, responses to each question were tabulated. Individual responses to questions were subdivided into the following categories: respondent demographics, referrals, assessment, intervention, and discharge. Open-ended text response data within each category were then analyzed line-by-line using an open coding process to determine key themes. Codes were then extrapolated from the transcribed open-ended responses and subsequently grouped according to these themes that exemplified OT practice behavior in terms of clinical approaches to driver rehabilitation. Preliminary analysis of key themes identified similarities and variations within and across practice areas in terms of inpatient as compared to outpatient settings. This method of grouping and then comparing responses has been used effectively in previous qualitative research (Patton, 1990), where the aim was to highlight similarities as well as variations in approaches across a relatively small sample. We performed descriptive statistics by calculating means and standard deviations to assess central tendency and spread of the quantifiable data where possible. We identified patterns in how the issue of driving is currently addressed during stroke recovery from the point of intake (i.e., referral for OT services) to both inpatient and outpatient rehabilitation settings in order to understand the processes in place along the continuum of care.

Results

Our questionnaire captured the demographics of our respondents as well as their respective areas of practice (i.e., inpatient or outpatient setting). Subsequently, we identified the assessment and interventions employed in clinical practice that address issues specific to returning to driving after stroke from initial referral to

discharge. Direct quotes from respondents are provided where appropriate to contextualize responses.

Respondent demographics

The sample represents the spectrum of stroke care offered in a hospital-based setting, with eight out of the 14 respondents from inpatient services and the other six from outpatient services. The majority of our respondents were female ($n = 13$). The age of respondents ranged from 32 to 52 years ($M = 38.3$, SD = 6.4). They also varied with respect to the length of time working in stroke rehabilitation ($M =$ 9.5 years; SD = 7.4; range = 1–25 years).

Respondents indicated that the issue of driving is addressed as part of their overall care plan. All clinicians working with inpatients assess driving as part of their practice; however, only three clinicians indicated that they also provide some form of intervention. At the outpatient level, all six clinicians reported offering both assessment and interventions specific to driving. Moreover, respondents providing inpatient stroke care reported that they have an average of eight referrals per month (ranging from 4 to 20) as compared to 18 referrals per month for clinicians working in an outpatient setting (on average, 8–28 referrals per month) over the past year. Driving was estimated by respondents to be a rehabilitation goal for at least half of their patients in both inpatient and outpatient settings.

Referral process

Respondents explained that referrals from a physician or other health care professionals varied as to whether the referees specifically listed driving as a reason for referral, as opposed to a general referral to OT. Clinicians reported that when driving was not specified on the referral, it would be identified as a goal through discussion with the patient or through their own reasoning based on the patient's general presenting deficits. When a referral was received for 1:1 outpatient OT from a community health care provider (e.g., family physician), driving was usually identified as the reason for assessment.

When asked for ways to improve the referral process, six respondents specified that they would prefer the physician to be the first to raise the issue of driving with the patient, as one respondent expressed: "The doctor needs to be more transparent - let them know they are going for a [driving] assessment … some patients don't realize until now." Eight respondents also indicated that further patient education is needed at the referral stage; specifically, that patients typically do not know why their license was suspended or the steps needed to have it reinstated. As well, respondents felt that communication could be improved between inpatient and outpatient care to reduce duplication of services; for example, an OT working in outpatient care stated, "If they recently failed Trails A & B as an inpatient, I'd skip right to planning their treatment."

Off-road (office-based) procedures for assessing driving after stroke

All respondents, regardless of setting, assessed the driving ability of stroke survivors. Clinicians employed a variety of screening approaches, including a combination of standardized (objective), technology-based, and non-standardized (subjective) measures. Table 1 outlines these measures.

Standardized screening tools

A total of 14 standardized measures were obtained. The most commonly used measures were the Motor-Free Visual-Perceptual Test (MPVT) (Colarusso and Hammill, 1972) and the TMT A and B. The Montreal Cognitive Assessment (MoCA) (Nasreddine et al., 2005) was also used more often by clinicians working in an inpatient setting than those in outpatient rehabilitation.

Technology-based screening tools

Technology-based measures were also used to assess driving performance after stroke. Of the three facilities, only one had access to a STISIM Drive 3000 driving simulator, which was described as a desk-mounted single-monitor apparatus with steering wheel, signal indicators, and accelerator and brake pedals. Nevertheless, 7 of the 14 respondents indicated that they used driving simulation as part of their

Table 1. Reported off-road driving screening conducted by occupational therapists.

Measure	Inpatient $n = 8$	Outpatient $n = 6$	Total N
Standardized screening tools			
Motor-Free Visual Perceptual Test	8	6	14
Original	5	3	8
Version III	3	3	6
Trails A&B	7	5	12
Montreal Cognitive Assessment (MoCA)	6	2	8
Symbol Digit Modality Test (SDMT)	3	3	6
Letter Cancellation/Other cancellation (Bell's)	2	3	5
King Devick	3	1	4
Rookwood Driving Battery	3	1	4
Line Bisection	2	1	3
Rivermead Behavioural Memory Test (RBMT)	2	1	3
Minimental Status Exam (MMSE)	2	0	2
Frostiig	2	0	2
Repeatable Battery for the Assessment of Neuropsychological Status (RBANS)	0	2	2
Stroke Driving Battery Test	0	1	1
Clock draw	0	1	1
Technology-based screening			
Simulator/Smart Driver	2	4	6
Useful Field of View	3	1	4
Dynavision	0	3	3
Subjective screening			
Gross physical/range-of-motion screening	5	1	6
Driving questionnaire/road sign recognition	2	2	4
Judgment scenario questionnaires	2	1	3
Scanning/visual attention work-sheets	1	1	2
Parquetry	0	2	2
Insight (informal observation)	1	0	1
Memory (informal observation)	1	0	1
Driving history interview	1	0	1

assessment process; however, when asked if they had a standardized protocol for assessing simulated driving scenarios, none of the clinicians identified using one. The interpretation of the patient's performance in the simulator was based on the OT's clinical reasoning.

Subjective screening tools

Non-standardized (subjective) approaches used by respondents to assess driving ranged from physical screening of gross-motor coordination to asking patients questions about their driving using hypothetical scenarios. Clinicians also reported that they observed patient behavior during driving screening tasks as well as during non-driving specific activities (e.g., group sessions) to determine whether there were any deficits in the patient's level of insight and judgment. Respondents stated they used this information as part of their clinical reasoning to make a determination about a patient's medical-fitness to return to driving after stroke.

Driving-related interventions: Readying a patient with stroke for returning to driving

Table 2 outlines the various technology-based activities, tabletop activities, and physical interventions used by clinicians. Inpatient therapists reported that their time spent on driving-related interventions was limited due, in part, to the focus on assessing and discharging patients. One clinician illustrated this limitation by saying that, "If a client has attention impairments then we will focus on improving attention, but we do not use [interventions that are] specific driving-related activities." In contrast, outpatient therapists described that when driving is a primary goal of the patient, an average of 38.4 min (SD = 7.8) of 1:1 time spent with OT, twice per week (SD = 1.0) over an average of 8.0 weeks (SD = 2.7) are devoted to the goal of returning to driving.

Technology-based activities

Technology-based interventions specific to addressing the goal of driving were identified by the sample in Table 2, which included driving simulators, computer games

Table 2. Driving intervention activities used by occupational therapists.

Intervention Activity	Inpatient $n = 8$	Outpatient $n = 6$	Total N
Technology-based activities			
Dynavision	4	4	8
Simulated driving (STIsim 3000)	4	3	7
iPad games and activities (various: e.g., Rush Hour, etc.)	3	3	6
Computer games and activities (various: e.g., lumosity.com)	2	3	5
Tabletop activities			
Pencil and paper worksheets (various: e.g., drawing, seek and find, etc.)	6	3	9
Driving scenario questionnaire	1	1	2
Physical activities			
Non-driving specific functional activities (various: e.g., walk, catch, look and find, path-finding, etc.)	2	3	5
Car control (various: e.g., foot-pedal press reaction time, steering wheel control, etc.)	3	1	4

(iPad), and web-based applications. In addition, the Dynavision light board was another intervention used by clinicians at one site. All respondents who provided driving-related interventions as part of stroke rehabilitation used some form of technology-based activity. When asked about their use of technology as an intervention, one of the respondents replied, "It [the technology] is essential, because there [are] a lot of things I can't do on my own – you need something [where] the screen changes, and you don't have that with the tabletop activities." This response was echoed by another therapist who explained, "The simulator challenges reaction time. Paper and pencil doesn't give the surprise or speed element."

Tabletop activities

Pencil and paper, or 'tabletop' activities, were described by clinicians as other forms of interventions, such as worksheets from puzzle books. These activities were believed by respondents to be relevant to driving with respect to improving underlying skills, such as visual attention, scanning, and problem solving. These activities included object finding, letter or shape cancellation, picture drawing or copying, and mazes.

Physical activities

Other interventions that focused on physical coordination and movement were adapted by clinicians with the aim of re-training the skills needed for driving. For example, throwing and/or catching activities were used to improve reaction time and coordination. Ambulation activities included environmental scanning and/or route-finding challenges. Clinicians also simulated the physical interactions drivers have with their car by including gas-to-brake pedal responses and some clinicians also measured the client's reaction time using a physical mock-up of car pedals.

Homework

Additionally, three respondents in the outpatient setting reported that they also provided clients with "homework." Homework involved supplemental activities that were prescribed to stroke patients to be performed independently from the in-person outpatient sessions. These "homework" activities included tablet and/or computer-based games and websites, as well as pencil and paper worksheets. Although respondents noted that clients who were prescribed homework did not always complete these activities, one clinician said, "The ones that do the work at home are more successful." Those clinicians who reported assigning homework to clients explained that it is a way to increase the amount of time focused on therapeutic intervention: "They have limited visits with me … learning has to be ongoing and non-stop."

Five out of the six clinicians working in outpatient settings asserted their need for evidence-based examples of intervention activities that are not only relevant to the client (i.e., offer high face (ecological) validity), but also have empirical evidence that supports their utility for improving on-road performance. Moreover, respondents expressed that further organization and structure of activities was particularly

important when it comes to interventions administered across the care continuum, as one respondent suggested, "Having a more standardized, uniform treatment plan approach is needed."

Discussion

The purpose of this study was to identify assessment and interventions currently used by clinicians along the continuum of stroke care in inpatient and outpatient hospital settings that are specific to returning clients to driving. Stroke survivors may present with cognitive, perceptual, physical, and/or behavioral impairments that impact the skills and behavior that are necessary for the safe operation of a motor vehicle. While functional assessment, including on-road evaluation, is still considered the best means of making a clinical determination of medical fitness to drive following stroke as well as other diagnoses (Dow, Simpson, and Molnar, 2012), subjecting a client to an on-road assessment may not be safe or appropriate at their stage in recovery. Furthermore, the cost of comprehensive driving evaluations (CDE) can be prohibitive for some clients. Hence, ensuring a client is ready for such an evaluation is critical. In this context, understanding both assessment and intervention practices that are being used with regard to driver rehabilitation after stroke is critical.

When it comes to assessment of the ability to return to driving after stroke, our findings indicate that clinicians employed a variety of standardized and non-standardized approaches. The TMT was the most common assessment measure used by respondents and has been identified as having one of the strongest predictive values for assessing individuals for returning to driving after stroke (Devos et al., 2011; Marshall et al., 2007). However, the second most commonly reported measure in our study, the MVPT (original version), was found by Devos et al. and Korner-Bitensky et al. (2000) to have poor predictive validity for on-road performance after stroke. Likewise, the MVPT-III (third version), which we also found to be widely used in practice, has yet to be validated as measure for predicting behind-the-wheel behavior (Mazer, Korner-Bitensky, and Sofer, 1998). In contrast, other predictive measures outlined in the systematic review by Devos et al., namely the Road Sign Recognition and Compass tests, were not among the clinical measures identified by our respondents. Our findings suggest that gaps remain in the translation of knowledge of research evidence to clinical practice, when it comes to using the most reliable and valid tools for assessing returning to driving after stroke.

Consistent with earlier findings (e.g., Logan et al., 2004), respondents indicated that returning to driving is one of the top priorities of their clients. Our results suggest that clinicians are employing a wide variety of interventions in an attempt to target stroke-related deficits that could impact driving, ranging from component-based tabletop (pencil and paper) activities to contextually relevant interventions that aim to remediate critical skills (e.g., driving simulators). These results are consistent with those of George et al. (2014) who noted that there is a major gap in evidence concerning interventions that can improve the ability to

drive after stroke. The range of objective and subjective interventions, including both the frequency and duration of each activity, reported by OTs in the current study reflect this gap. In particular, clinicians expressed that they were unsure of which approaches were best and, as a result, were using whatever methods were at their disposal to help their clients return to driving (e.g., tablets, computers, simulators, and pencil and paper activities). In addition, some respondents prescribed homework activities as a means to increase the amount of time spent on driving-focused intervention. Respondents suggested that patients who participated in homework activities may perform better on follow-up testing; however, the effectiveness of a homework program on driving outcomes has yet to be empirically evaluated, and it remains to be determined what factors affect patient adherence to this regime. Our preliminary findings highlight the need for further research to establish if there is in fact a beneficial impact on driving outcomes when patients spend more time on practice (i.e., homework). As well, further investigation of the optimal format and dosage of a homework program should also be investigated.

For stroke survivors there is a complex interaction between potential stroke-related deficits and the requisite skills need for driving; hence, deficits identified from clinical assessment are key to determining the focus of interventions. As suggested by Marshall et al. (2007), the explicit use of a comprehensive model of driving behavior can benefit both research and practice for helping individuals return to driving after stroke. Theoretical grounding is crucial to ensure that all levels of skills and behavior are assessed in order to effectively identify deficits and determine interventions that target key areas. In this context, Marshall et al. proposed that Michon's (1985) hierarchical model of driving behavior serves as an appropriate framework for selecting assessment measures and, in turn, for organizing off-road activities that reflect aspects of driving behavior for the stroke survivor. Using this framework and the results of the present study, Table 3 illustrates an example of how deficits, as

Table 3. Examples of reported clinical interventions mapped onto Michon's Hierarchical Model of Driving Behaviour (1985).

Theoretical Level (Michon's Model)	Stroke-related Deficits	Intervention Description
Strategic level	Insight, judgment, behavior	A driving simulator was used by respondents to address issues related to driving behavior. Specific driving scenarios such as construction zones, as well as modifications to traffic variables (e.g., the addition of pedestrians crossing) were selected to elicit changes in driving behavior and judgment. The ability to safely fail, i.e., collision, was also used as a means to build insight.
Tactical level	Visual processing, sensory integration	The Dynavision light board was most commonly used by respondents to improve visual processing skills related to driving, such as scanning and visual attention. Dynavision requires the patient to scan and reach out to press sequentially lit buttons in an array.
Operational level	Motor ability, coordination	A staged car was used by clinicians to improve the physical components of vehicle operation, such as entering and exciting the car, and to conduct upper extremity range of motion exercises using the steering wheel.

determined through assessment, could be targeted for treatment. Our findings suggest that current approaches to interventions are not well organized with respect to targeting specific deficits in a manner that is consistent with any explicit theoretical model. Therefore, this table provides the first attempt (to our knowledge) to map interventions that are used for post-stroke rehabilitation with respect to targeting the skills necessary to perform the complex task of driving.

In summary, this study provides an overview of assessment and intervention approaches currently used by occupational therapists along the care continuum. While the sample from which the results are drawn is relatively small ($n = 14$), our methods provide an opportunity to explore the procedures employed by respondents in depth. However, it is important to acknowledge that the approaches identified by our sample may not be representative of all practices used within this population of clinicians. We have identified that there is presently a need for a more organized delivery of interventions that is informed by the best evidence when it comes to helping clients return to driving after stroke. As such, our team is currently performing a feasibility study to develop and evaluate a driver-training program for individuals post-stroke with the subsequent aim of conducting a larger randomized trial.

Conclusion

Our results identified the assessment and intervention practices that are used by therapists to help clients return to driving after stroke. Moreover, our findings highlight the variability in these practices, particularly when it comes to interventions. Using a model of driving, we introduce a framework that provides a means to identify stroke-related deficits and, in turn, design treatment plans accordingly. By understanding the practices currently employed to address the issue of returning to driving after stroke along the rehabilitation continuum, our aim is to develop clinical protocols informed by the best available evidence that will be further evaluated in our future studies.

Acknowledgments

The authors thank the clinicians who volunteered for this study and completed the questionnaires.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

Funding

This study was supported by a grant from the Canadian Occupational Therapy Foundation.

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