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Power Mobility Driving Training for Seniors: A Pilot Study

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This article describes two power mobility training protocols used with seniors and compares posttraining driving performance. Twelve users of power mobility were consecutively recruited from two residential facilities in Toronto, Canada. The aim of training at both sites was to make clients comfortable with and safe at driving power mobility devices. The content of training was similar, but training protocols differed significantly in terms of the number of sessions (means of 3.43 vs. 9.80; $p \leq .05$) and the time frame over which the sessions were offered (means of 1.57 vs. 5.10 weeks; $p \leq .01$). Participants at the two sites differed significantly in terms of overall driving performance ($p \leq .05$), gender ($p \leq .01$), and type of device used ($p \leq .05$). Overall, driving performance was significantly associated with facility, gender, type of device used, and training duration ($p \leq .05$). When these variables were entered into an exploratory hierarchical regression, facility accounted for 64% of the variance in driving performance. When facility was controlled for, the correlations between device and duration of training with driving performance were no longer significant. The determinants of driving performance are difficult to clearly specify as the variable facility encompasses gender as well as all other differences between the two training protocols. Nevertheless, these data provide direction for future research in this area.

Key Words: Power mobility—Wheelchair training—Intensity—Geriatrics—Power-Mobility Indoor Driving Assessment (PIDA)

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The use of power wheelchairs and scooters by the elderly has increased dramatically in recent years. These power mobility devices increase independence and improve the quality of life of individuals with mobility limitations (Miles-Tapping & MacDonald, 1994; Scott-Taplin, Smith, McLaughlin, & Mathews, 1989). However, the safe use of these devices is a growing concern as the number of accidents involving these devices is also increasing, especially among elderly users (Kirby & Ackroyd-Stolarz, 1995; Reed, Yochum, & Schloss, 1993; Ummat & Kirby, 1994). One way to increase safety and optimize power mobility driving performance is through training elderly clients in the use of these devices (Kirby, Coughlan, & Christie, 1995). The overall purpose of this article is to begin a discussion that will ultimately lead to delineating and understanding best practice for promoting safe and effective use of power mobility among elderly users.

Training clients in the use of power mobility devices is important, not only to enhance safety and driving performance, but also to increase satisfaction with the devices and conversely decrease abandonment (Lange, 2000). Given the cost of these devices to the health care system, organizations, and individuals, this latter point it not trivial. In the United States, approximately 16 of every 1,000 people 65 and older use either a power or manual wheelchair (Calder & Kirby, 1990). In Ontario, the number of individuals aged 65 and older who received funding assistance from the Ministry of Health and Long-Term Care for power mobility devices through the Assistive Devices Program rose by 340% between 1995 and 2001. Reasons for the increase in power mobility use by the elderly include technological advances resulting in suitable and effective means of mobility for individuals of all ages and ability level (Kirby et al., 1995) and the growing percentage of the population aged 65 and older (Rosenburg & Moore, 1997). The higher prevalence of chronic conditions and subsequent disability among the elderly also results in an increased use of these devices (Wilkins & Park, 1996).

Coincident with the rise in power mobility use is the number of accidents involving seniors. Ummat and Kirby (1994) evaluated nonfatal wheelchair-related accidents reported between 1986 and 1990. From these data, the average number of accidents was estimated at 36,559 per year. The mean age of persons reporting accidents was 60.6 years, and persons in the 80–89 year age group were most frequently affected, accounting for almost a quarter of the total accidents. Calder and Kirby (1990) identified 770 cases of wheelchair-related deaths between 1973 and 1987. Cases involving individuals 60 years and older accounted for 87% of the total fatalities. Over 80% of these fatal accidents occurred indoors, either in the home or an institutional setting. Of nonfatal accidents reported, over 70% happened in indoor environments (Ummat & Kirby, 1994). These statistics highlight the necessity of promoting safe driving, particularly in the living environment of seniors who use power mobility.

Although there is a clear trend toward increasing use of these devices by seniors, there does not appear to be a corresponding trend in training drivers. Reed et al. (1993) reported that less than half of residents using power scooters in three institutional settings had any type of formal training in the use of these devices. Furthermore, limited literature is available to inform therapists with respect to training clients. Existing research has focused primarily on power mobility driving training involving children (Furumasu, Guerette, & Tefft, 1996; Nisbet, Craig, Odor, & Aiken, 1996; Tefft, Guerette, & Furumasa, 1999).

Nevertheless, there are theories and some research that point to the direction training should take. Occupational therapy theory suggests that optimal mobility arises from the transactional relationship between the person, the environment, and the tasks or occupations with which the person is engaged (Law et al., 1996). This approach is supported by the work of a number of researchers who highlight the importance of using a multifaceted approach to facilitate independent, optimal, and safe use of power mobility (Field, 1999; Routhier, Vincent, Desrosiers, & Nadeau, 2001; Ummat & Kirby, 1994). They have identified the following factors as important in power mobility use: the user's profile; the wheelchair; the environment; daily activities; social roles; and the activity of driving, which includes training. Interestingly, we are aware of no studies that address issues of the amount or intensity of training necessary for optimal power mobility use.

Intensity of therapeutic interventions is defined by Keith (1997) as "the duration and frequency of a procedure within a given time span" (p. 1299). A number of researchers studying different aspects of rehabilitation have demonstrated that a greater intensity of treatment results in better outcomes for the client compared with less intense treatment when other factors (e.g., diagnosis, age) are taken into account. For example, Chiodo, Gerety, Mulrow, Rhodes, and Tuley (1992) found that 88% of elderly nursing home residents who received high-intensity physical therapy improved in physical function compared with 33% and 13% who received moderate and minimal intensity therapy, respectively. These changes could not be accounted for by age, cognitive status, level of independence in activities of daily living, or diagnoses. Similarly, a meta-analysis of nine controlled studies involving 1051 stroke patients showed significant improvements in activities of daily living and neuromuscular and functional outcomes as a result of more intense occupational and physical therapy (Kwakkel, Wagenaar, Koelman, Lankhorst, & Koetsier, 1997).

In summary, to date, limited information exists to inform therapists with respect to training elderly clients in the use of power mobility devices. Yet available statistics indicate both an increase in the number of elderly power mobility users and in the number of power mobility accidents. We believe that training new drivers in the use of their power mobility devices will enhance performance, improve safety, and increase functional mobility. The overall purpose of this study was to begin to explore the impact of training on performance among users of power mobility. Specifically, this article

- describes two power mobility driving training protocols used with elderly clients at two long-term care facilities;
- compares the socio-demographic, diagnostic, and mobility-related characteristics of the clients at these facilities; and
- investigates whether there is a significant difference in power mobility driving performance arising from different power mobility training

protocols, specifically in terms of training intensity.

METHODS

Participants

Participants for this study were recruited over a 7-month period (February–August 2002) from the Baycrest Centre for Geriatric Care (Baycrest) and the Long-Term and Veterans Directorate at the Sunnybrook and Women's College Health Science Centre (Sunnybrook). To be eligible, residents of these facilities had to be 65 years or older, be deemed competent to consent by the health care team, speak and understand English, and be medically able to participate in the power mobility driving training program. Participants had mobility limitations arising from diagnoses of stroke; chronic obstructive pulmonary disorder (COPD); multiple sclerosis (MS); or a musculoskeletal-related diagnosis (e.g., osteoarthritis). Participants may have used a power mobility device sometime in the past (e.g., rented a scooter when on an outing); however, to obtain a new device and use it within the facility, both facilities required and provided training. Of the 13 people deemed eligible to participate, all gave written informed consent to participate in the study. One of these was excluded later because complete data could not be obtained.

Instruments

To assess the power mobility driving performance of the participants, the Power-Mobility Indoor Driving Assessment (PIDA) was used (Dawson, Chan, & Kaiserman, 1994; www.fhs.mcmaster.ca/powermobility; see Appendix for score sheet). This assessment was designed to measure driving performance indoors for residents of long-term care facilities who use power mobility. Up to 30 items can be scored, but only items necessary for individuals to perform within their environment are scored. For example, if someone never has to access his or her bed from the right, this item is not tested. Each item is scored on a 4-point Likert-type scale from 1 (*unable to complete task*) to 4 (*completely independent*). The PIDA has content and face validity, moderately good intrarater reliability, and very good interrater reliability.

To characterize the cognitive level of participants, the Standardized Mini-Mental State Examination (SMMSE) was used (Molloy, Alemayehu, & Roberts, 1991). This instrument contains 30 items that measure orientation to time and place, immediate recall, short-term memory, calculation, language, and constructive ability. The SMMSE was chosen for several reasons. It is the most widely used assessment to measure cognitive impairments in seniors, it is easy to administer and score, and it has very good intrarater and interrater reliability. Typically, a score of 24 of 30 or above indicates there is no dementia present.

Attention to extra-personal space was assessed with the Bells test (Gauthier, Dehaut, & Joanette, 1989). This assessment, which detects visual neglect, consists of a paper divided into seven columns, each of which contains 35 distracter and five target items (bells). Neglect and lack of attention can be determined from the number and pattern of targets circled. The test has good validity, and some normative data are available (Spreen & Strauss, 1998). It was selected for this study because it is quickly and simply administered and has been demonstrated in at least one study to be superior to other tests in terms of detecting visual neglect (Ferber & Karnath, 2001).

Intensity of driver training was measured as the total number of training sessions divided by the duration of training in weeks. The number of sessions were recorded to include the initial training session to the final session prior to the posttraining PIDA. The duration of training was measured as beginning at the initial training session and ending on the date of the administration of the posttraining PIDA. Socio-demographic characteristics were determined from a short questionnaire administered to the participants.

Driver Training Protocol

This article compares two training protocols: those in use at Baycrest and Sunnybrook at the time this study was conducted. A comparison of the training protocols is summarized in Table 1. Both centers have used the PIDA for some time as a way of measuring driving performance. Thus, the skills required by the PIDA are those incorporated into the training. As such, the content of training at the two sites was similar. If a client had no prior experience using a power mobility device, they were provided with an orientation to the device in the first session. Skills covered in this session included transferring to and from the power mobility device, turning the controls on and off, adjusting the speed, adjusting the seat belt, and driving in all directions within the client's immediate environment (e.g., room or unit of the facility). Subsequent sessions included learning and/or practicing skills listed on the PIDA. However, clients were not trained in all items on the PIDA, but rather only

TABLE 1. Comparison of power mobility driving training protocols

	Baycrest	Sunnybrook
Documented training protocol	No	Yes
Standard number of sessions	Twelve 1-hour sessions	Six 1-hour sessions
Standard duration of training	3 weeks	2 weeks
Trainer	OTs and OT assistants	OT assistants
Pretraining PIDA	Not routine	Not routine
Posttraining PIDA	Routine	Routine
Blind rater for posttraining PIDA	No	Yes

Note: PIDA = Power-Mobility Indoor Driving Assessment; OT = occupational therapist.

those skills that were applicable to that client. For example, a client who did not use the device in the bathroom was not trained in skills that corresponded to items five through eight on the PIDA.

There are a few key things to note in comparing the two training protocols (see Table 1). First, the protocol at Sunnybrook was documented with specific content for each of the six sessions routinely provided. At Sunnybrook only, this included a formal session on maintenance and care of the power mobility device. In contrast, the content of the training protocol at Baycrest was individualized and determined by the occupational therapist (OT) as clients' needs for more or less practice on particular skills emerged. The second thing to note is that the amount, duration, and intensity of training differed between the two sites. At Sunnybrook, routine practice entailed six 1-hour sessions over 2 weeks (3 sessions/week). At Baycrest, routine practice entailed twelve 1-hour sessions over 3 weeks (4 sessions/week). Third, an OT blind to the results of the training routinely administered the posttraining PIDA at Sunnybrook. Interestingly, neither site routinely did pretraining PIDAs, although of the five participants recruited at Baycrest, three had pretraining scores.

Procedure

Occupational therapy at both sites continued in a routine manner during the course of this study. Clients who received training in the use of power mobility were asked to participate in the study only after the posttraining PIDA was administered and after a decision was made regarding their driving status (i.e., safe/unsafe to drive within the facility). The outcome of training was determined prior to recruitment so that clients' decisions to participate in the study could in no way impact their driving training, evaluation, or decisions regarding driving status. The OTs then asked the clients if they could be approached regarding a research study. With their verbal consent they were approached by the principal investigator (PI) and invited to participate in the study. Upon written consent, the PI obtained the participants' training documentation and conducted an interview with participants. The interviews took approximately 20–30 minutes and included socio-demographic questions, the SMMSE, and the Bells test. The study received ethics approval from the Sunnybrook, Baycrest, and University of Toronto scientific and ethics review boards.

Planned Analyses

Descriptive statistics were done on all variables in order to characterize the sample, and differences on these variables across the two sites were calculated. Interval and ratio data (e.g., training amounts and posttraining PIDA scores) were analyzed using t tests. Nominal data were analyzed with Fisher's exact χ^2 (e.g., gender and type of device). Correlational analyses were run between the dependent variable, driving performance, as measured by the posttraining PIDA and the descriptive variables. Nonparametric correlations were used due to the categorical nature of some data and the small sample size. The Kendall τ-b was selected as it controls for data that have the same rank. Based on the results, an analysis of variance (ANOVA) was conducted to determine how much of the variance in posttraining driving performance could be accounted for by the independent variable, facility. Additionally, partial correlations were run between the power mobility training characteristics found to differ between the two sites and posttraining driving performance while controlling for facility. This was done to determine if differences in the training protocol would still be correlated with driving performance when controlling for the variation explained by the facility variable. A significance level of .05 was set, although differences and correlations with p values $\leq$ .10

TABLE 2. Participant characteristics

	Baycrest (n = 5)	Sunnybrook (n = 7)
Age		
M (*SD*)	86.60 (9.53)	81.71 (5.94)
Range	73–97	76–91
Ratio of males:females*	0:5	7:0
Education completed		
< High school	1 (20%)	5 (71.4%)
≥ High school	4 (80%)	2 (28.6%)
Diagnosis		
Stroke	1 (20%)	1 (14.3%)
COPD	0 (0%)	1 (14.3%)
MS	0 (0%)	1 (14.3%)
Musculoskeletal	4 (80%)	4 (57.1%)
SMMSE score, *M* (*SD*)	24.80 (5.50)	25.71 (2.50)
Bells test score, *M* (*SD*)	28.75 (6.75)	30.43 (3.26)

Note: COPD = chronic obstructive pulmonary disorder; MS = multiple sclerosis; SMMSE = Standard Mini-Mental State Examination.
*$p \leq 0.01$.

are discussed as potentially representing a trend in the data. All analyses were conducted using SPSS 10.0.

RESULTS

Characteristics of the participants are shown in Table 2. There were no statistically significant differences between participants at the two sites except in terms of gender ($p \leq .01$), as all participants at Baycrest were women and all at Sunnybrook were men. However, participants at Baycrest showed a trend toward being older, on average by 5 years, and being more educated with 80% having finished high school compared with 29% of Sunnybrook participants.

Table 3 shows the mobility-related characteristics of the 12 participants. There were no significant differences between the participants at the two sites in terms of their previous driving experience (motor vehicle or power mobility). However, there was a trend for participants at Sunnybrook to have more motor vehicle driving experience (100% compared with 60% at Baycrest) and for participants at Baycrest to have more power mobility driving experience (100% compared with 43% at Sunnybrook). The two groups were significantly different in terms of the type of device used. All participants from Baycrest used power wheelchairs, whereas only 29% (2/7) of users at Sunnybrook used power wheelchairs ($p \leq .05$).

Data on the training protocol are also shown in Table 3. As per the protocol, the amount of training provided at Baycrest was significantly more than that provided at Sunnybrook, with an average of 9.80 sessions compared with 3.43 sessions ($p \leq .05$). The duration of training was also significantly greater at Baycrest, averaging 5.1 weeks compared with 1.57 weeks ($p \leq .01$). However, the intensity of training (sessions/week) was not significantly different. Data on the length of each training session was available for only one participant at Sunnybrook, thus disallowing comparison.

In terms of driving performance, there was a significant difference between the two groups, with drivers at Sunnybrook having a mean posttraining PIDA score of 96.84 of 100% compared with 86.85 of 100% among Baycrest drivers ($p \leq .05$). There was no difference in posttraining PIDA scores between users of specifically power wheelchairs at either site—there were no scooter users at Baycrest for comparison. However, when the participants at both sites were pooled, a significant difference on driving performance was found between the drivers of wheelchairs and scooters. Drivers of wheelchairs had a mean posttraining PIDA score of 89.08 of 100%, and drivers of scooters had a mean score of 97.71 of 100% ($p \leq .01$). Pretraining PIDA scores were only available for three of the participants, thereby disallowing analyses of this variable.

Table 4 shows the relationships between sociodemographic, morbidity, and power mobility characteristics and driving performance. Four variables were found to be significant at the .05 level: gender, facility, device used, and duration of training. Men at Sunnybrook driving scooters with shorter durations of training had higher posttraining PIDA scores. In addition, there appeared to be a trend for a higher number of training sessions to be associated with lower training scores. However, all of these variables are interrelated as the sample at Sunnybrook are all men, all the scooter drivers are at Sunnybrook, the average duration of training at Sunnybrook was significantly shorter, and there were fewer training sessions at Sunnybrook.

Based on these results, an ANOVA was conducted with driving performance as the dependent variable and facility as the independent variable. In this analysis, facility accounted for 64% of the variance in driving performance. To determine if training protocol characteristics were still correlated with driving performance while controlling for facility, partial correlations were run between the power mobility characteristics and driving performance. When facility was controlled for, the cor-

TABLE 3. Power mobility–related characteristics

	Baycrest (n = 5)	Sunnybrook (n = 7)
Ratio of wheelchair:scooter users**	5:0	2:5
Previous driving experience		
Motor vehicle	3 (60%)	7 (100%)
Power mobility	5 (100%)	3 (42.9%)
Actual power mobility training		
Number of sessions		
M (SD)**	9.80 (2.77)	3.43 (2.44)
Range	5–12	1–6
Duration in weeks		
M (SD)*	5.10 (1.34)	1.57 (1.24)
Range	3–6.5	0.5–4
Intensity (sessions/week)		
M (SD)	1.91 (0.23)	2.21 (0.57)
Range	1.67–2.2	1.5–3
Session length (minutes)		
M (SD)	54.87 (9.93)	[a]
Range	15–90	[a]
Power mobility driving performance (posttraining PIDA scores)		
PIDA score		
M (SD)**	86.85 (5.18)	96.84 (3.11)
Range	81.7–95.0	92.0–100
Wheelchair users		
M (SD)	86.85 (5.18)	94.66 (3.76)
Range	81.7–95.0	92.0–97.3
Scooter users		
M (SD)	N/A	97.71 (2.77)
Range	N/A	93.0–100

Note: PIDA = Power-Mobility Indoor Driving Assessment.
[a]Data available for only 1 of 7 participants.
*$p \leq .01$. **$p \leq .05$.

relations between device and duration of training with driving performance were no longer significant.

DISCUSSION

Our primary finding is that posttraining driving performance was significantly better at one site than the other. As there were significant differences in the participant characteristics between the sites, we cannot isolate this finding to differences in the training protocol, but rather suggest this finding be used to direct future research.

The most obvious difference between the two groups was gender and, related to this, associated past roles. All participants from Sunnybrook were men and also all veterans of the Armed Forces. Although there was no significant difference between the two facilities in terms of past motor vehicle driving experience, the difference may have been clinically relevant (60% at Baycrest compared with 100% at Sunnybrook). Many of the male veterans, in addition to driving a car for several decades, also had experience driving other vehicles, including airplanes, army tanks, and/or jeeps. One participant stated that learning to drive a power wheelchair was easy for him because he had several years experience flying an airplane that had similar controls to his power wheelchair. This overall past experience by the veterans at Sunnybrook may have enhanced their power mobility driving abilities relative to the participants at Baycrest.

The type of device used may also have affected driving performance. Again, this variable (device)

TABLE 4. Associations between participant characteristics and training variables with driving performance (posttraining PIDA scores)

Variable	Correlation (p value)
Socio-demographic characteristics	
Age	−0.250 (.267)
Gender	**0.645 (.012)**
Education	−0.451 (.780)
Past car driving experience	−0.440 (.860)
Morbidity characteristics	
MMSE score	−0.147 (.526)
Bells test score	−0.150 (.530)
Power-mobility characteristics	
Facility	**0.645 (.012)**
Past power mobility driving experience	0.435 (.089)
Device used	**0.645 (.012)**
Number of training sessions	−0.413 (.070)
Duration of training in weeks	**−0.469 (.038)**
Intensity of training	0.244 (.301)

Note: Significant associations are bolded. PIDA = Power-Mobility Indoor Driving Assessment.

was subsumed in facility as all the scooter drivers were at Sunnybrook. Conceivably a higher level of perceptual and fine motor skills are required to maneuver a power wheelchair via a joystick (the type of control used by all wheelchair drivers in this study). In contrast, scooters are controlled through a tiller bar with more natural directional controls. The resulting performance difference may arise from the fact that driving a scooter may tap into previously learned procedural skills, such as riding a bicycle. Further, a scooter provides more physical freedom than does a wheelchair. This results in much more physical ease with visual checking of the environment, which is necessary to prevent accidental collisions.

Our second major finding is that there are substantially different approaches to training people in the use of power mobility, even between two sites that are closely related in a number of ways. Both are University of Toronto teaching sites, both use the PIDA as their primary measure of driving performance, and both have therapists who have been involved in the instrument development of the PIDA and/or the Power-mobility Community Driving Assessment (PCDA; Letts, Dawson, & Kaiserman-Goldstein, 1998). Nevertheless, one site has a much more structured approach to training than the other and delivers less training over a shorter period of time. Although these characteristics were not correlated with driving performance once other differences between the two facilities were controlled for, this may have been an issue related to sample size, and merits further investigation. As such, factors related to the driving training protocol across the two sites warrant discussion. Duration of training and the number of sessions were significantly different between the two sites. Power mobility users at Sunnybrook received fewer sessions on average over a shorter time period. A possible explanation for this is that the male veterans, driving scooters, were able to develop adequate driving skills in a shorter time period, and accordingly their training was truncated. However, these results merit further exploration in relation to what is known about acquisition and retention of procedural memories.

Doyon and Ungerlieder (2002) summarize research findings that suggest there are three stages in the acquisition of motor skills. The first is an early, fast learning stage where there is great improvement over one training session. A second proposed stage is a consolidation phase occurring at about 6 hours after the original training, provided there is no interference from other tasks that need to be learned in that window. The final stage is a slower stage that occurs across sessions in which the behavior becomes well learned and can be retrieved readily over long periods without practice. Utilizing these stages in designing a training protocol could mean that for persons previously skilled in driving, virtually no training is required, as the previously learned skills (e.g., riding a bicycle and other transferable driving skills) are readily retrieved (particularly for scooter drivers). However, for those with little previous driving experience, training will need to occur across a number of sessions so that the behavior becomes well learned. Zanetti et al. (2001) have shown that other procedural skills can be retained following training even in patients with mild dementia. Their training protocol was 1 hour/day, 5 days/week for 3 weeks. These thoughts are offered purely in a speculative manner to prompt further research in this area.

To return to the data in this study, it is important to recognize that this was a pilot study with a very limited sample size done in the context of routine clinical care. Although the therapists reported standard protocols prior to the beginning of the study and adhered to these as much as possible, the demands of clinical practice do not always permit following the type of protocol that is necessary for rigorous research. This problem is further highlighted by the fact that a pretraining PIDA is not routinely done. Therefore, we do not know the baseline driving performance of most of the participants—a significant flaw in this endeavor that must be remedied in future studies. Furthermore, posttraining driving performance was assessed by an OT blind to the training process only at one site (Sunnybrook). In contrast, at Baycrest the therapist involved in the training assesses posttraining driving performance. This is standard practice in many clinical departments but may, in fact, have impacted scoring the PIDA at Baycrest. Clinicians involved in training individuals in the use of power mobility devices should consider having a person blind to the training process administer the posttraining assessment to ensure an unbiased evaluation of the driving. This is particularly important given the incidence of accidents and crashes using these devices.

Three final comments about the sample and data follow. First, we did not find an association between age and driving performance nor a statistically significant difference in age between the two sites; however, it is worth noting that participants at Baycrest were on average older by 5 years, a potentially clinically significant difference. Literature in the area of rehabilitation for older adults indicates the "young old" do better in rehabilitation than the "old old." For example, Falconer, Naughton, Stasser, and Sinacore (1994) compared the performance of older adults involved in rehabilitation following a stroke. The oldest patients (75 and older) performed significantly poorer in motor function skills and required more care than "younger" groups (65–74 and <65).

Second, most of the participants in this study had a number of medical issues. This study analyzed only the medical diagnosis that most impacted mobility. Wells, Seabrook, Stolee, Borrie, and Knoefel (2003) suggest that disability among seniors is multicausal and seniors with multiple medical problems have a greater degree of functional impairment than those with a single medical issue. Delving more deeply into the potential impact of comorbity on power mobility driving performance would be an interesting area for future research.

Third, one study participant was later removed from the data set due to incomplete data, as earlier indicated. On administration of the posttraining PIDA, this individual's driving performance was considered so unsafe that the testing was stopped and the PIDA was not completed. Had the completed items been prorated to generate a summary score, this individual would have achieved a score of 57.4 out of 100% on the PIDA, well below that of all other participants. This participant received the standard six training sessions, but due to illness, training occurred over a period of 5 weeks, a much longer duration than all other participants at Sunnybrook. One wonders if a different protocol based on our understanding of the acquisition of procedural memory would have resulted in improved driving performance.

Despite the limitations of the study, we are encouraged by the fact that clinicians are developing standard treatment protocols that lend themselves to investigation through a research process. This study represents an ideal situation where researcher and clinician have worked together. This research would not have been done without the openness of the clinicians. Collaborations, such as this one, allow clinicians to change practice based on empirical data and researchers to undertake clinically meaningful research and further investigations based on the needs of the clinic.

To conclude, successful and safe driving is a multifactorial process involving personal, environmental, and task-related characteristics. This study began investigation of the personal and training factors that impact on driving performance. Preliminary findings suggest a number of factors contribute to driving performance including gender, type of device, and time period over which training is provided. Further research is needed to explicate these factors more clearly and should be undertaken in the context of what we know about the acquisition and retention of motor skills. Our findings suggest that power mobility driving training is one factor that can have a significant impact on optimal power mobility driving performance. As the number of seniors who require power mobility devices continues to grow, it is imperative that researchers and clinicians together strive to establish evidence-based training programs that will ensure that individuals of all ages are provided with a safe and appropriate means of independent mobility.

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APPENDIX. Power-Mobility Indoor Driving Assessment: Score Sheet

Check all applicable items. Non applicable items should be marked with an "X" in the 'applicable' and 'score' boxes.

Scoring

4	Completely Independent.
3	Completes tasks hesitantly, requires several tries, requires speed restriction, ***and/or*** bumps walls, objects, etc. lightly (without causing harm).
2	Bumps objects or people in a way that causes or could cause harm.
1	Unable to complete task.

ITEM	Applicable	Score	Comment
Bedroom			
1. Accessing Bed - Right			
2. Accessing Bed - Left			
3. Approaching Dresser			
4. Approaching Closet			
Bathroom			
5. Into Bathroom			
6. Approaching Sink			
7. Approaching Toilet			
8. Exit Bathroom			
Doors			
9. Sliding Doors - mat trigger			
10. Swing Open Doors - mat trigger			
11. Automatic Doors - button trigger			
12. Regular Doors			
Elevator			
13. Entering Elevator			
14. Spacing in Elevator			
15. Exiting Elevator			
Parking			
16. Parking under table			
17. Parking beside table			
18. Back-in Parking			
19. Parallel Parking			
Ramps			
20. Up a ramp			
21. Down a ramp			
Skilled Driving			
22. Turning right			
23. Turning left			
24. 180° Turn			
25. Driving backwards			
26. Manipulating - congested area			
27. Maneuverability			
28. Obstacles - unexpected			
n.b. The final two test items are observed throughout the test and should be scored at the end.			
29. Speed selection			
30. Sharing public space			