Development of the power-mobility Community Driving Assessment.

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The purpose of this study was to develop an assessment of power-mobility driving for adults in the community. This article describes the methods used to develop the assessment and its final form. The Power-mobility Community Driving Assessment (PCDA) was developed using a modified nominal group consensus method. Ten participants included both users of power-mobility devices and occupational therapy clinicians with expertise in prescribing or training people to use power-mobility devices. The process used to develop the instrument involved a series of five meetings with some work done through correspondence between meetings. The PCDA is based on actual driving performance in the driver's usual environments. Through the development process, face and content validity of the instrument have been established. Initial pilot testing supports the clinical usefulness of this instrument. Further work to evaluate psychometric properties of the PCDA is now required.

Key words: power-mobility, community, mobility, assessment, nominal group process

INTRODUCTION

This article describes the development of a new instrument, the Power-mobility Community Driving Assessment (PCDA), designed to be used to assess community driving in adults who use power-mobility. The PCDA evaluates the person-environment interaction observed when people drive power-mobility devices in a variety of community settings. This instrument is needed because of the increasing numbers of power-mobility devices being used, the range of choices in equipment and device adaptations available, and the potential risks for accidents if drivers are not skilled in using the device in the community.

Power-mobility has a significant impact on the lives of users (Miles-Tapping & MacDonald, 1994). It can provide individuals with a source of mobility that is energy-efficient, so that they can more easily engage in self-care, productivity and leisure roles independently. Despite the sparseness of research testing the hypothesized link between the use of power-mobility and quality of life (Miles-Tapping & MacDonald, 1994; York, 1989), users of power-mobility devices as well as clinicians attest to its validity.

Although difficult to estimate, the number of power-mobility users in North America has certainly increased in recent years. Power-mobility devices, i.e. power wheelchairs and three-wheeled scooters, first became available to people with disabilities in the early part of the 20th century (Kamenetz, 1969). However, because of their weight and the inability to travel with them in a vehicle, they were abandoned for manual wheelchairs. Further refinements to power-mobility devices in the 1960's, advances in motorized lifts and vans in the 1980's, along with government funding assistance and the independent living

movement's emphasis on community integration have meant that power-mobility devices are more frequently used by adults with physical disabilities as compared to the past (M. Trembly, personal communication, August 29, 1995). In the United States of America (U.S.A.), it is estimated that electric mobility aids are used by 750,000 people (Reed, Yochum & Schloss, 1993).

The increasing number of persons using power-mobility has resulted in a greatly increased demand on rehabilitation professionals to determine driving competence or to identify driving skills needing training to attain competence. Wheelchair accident statistics provide evidence of the risks involved. In the U.S.A., more than 26,000 wheelchair related accidents, serious enough for the injured person to seek medical care, were reported in 1987 (Calder & Kirby, 1990). To date, no one has attempted to compare the incidence of accidents involving power-mobility devices and manual devices. However the numbers are alarming. The scope of this problem has led researchers to assert the need for careful prescription and training (Calder & Kirby, 1990; Hays, Jaffe, & Ingman, 1985), and for a standardized assessment of driving skill (Reed et al., 1993). Moreover, users of power-mobility who received no training relate a variety of incidents and accidents associated with the time when they are learning to drive.

Few assessments are available that provide clinicians with a means to assess the power-mobility driving skills of clients. Those that do exist tend to have been developed to meet the needs of specific institutions, without attention to instrument development processes, standardization or reliability and validity testing. These "home made" checklists may be guides to assist in assessment, but do not meet measurement standards for rehabilitation (Johnston, Keith, Hinderer, & Gonnella, 1992). The only standardized, comprehensive assessment related to driving power-mobility devices is the Power-mobility Indoor Driving Assessment (PIDA)(Dawson, Chan & Kaiserman, 1994). However, it was designed only to assess the indoor mobility of persons who live in institutions and use power wheelchairs and scooters, and does not cover driving in community settings. It was constructed using a three step consensus approach, and was developed to comprehensively assess a person's power-mobility driving performance at one point in time, with a scoring system that allowed it to be sensitive to changes in performance over time. Initial testing of reliability and validity were encouraging (Dawson et al., 1994). Although the clinical need for an instrument to evaluate driving indoors was met by the PIDA, its development did not address driving skills outdoors or in community settings. The skills required to drive a power-mobility device in the community differ from those for indoor driving because of the varied and constantly changing environments encountered by drivers.

The context or environment within which driving occurs is of utmost importance when considering the skills necessary for community driving. It is the transaction between the person's skill and the environment that will determine how well a person is able to drive a power-mobility device independently in the community. This transaction can be understood in a number of ways. First, the power-mobility device itself must be considered a critical part of the individual's immediate physical environment. Thus, an instrument to measure community driving ability must identify necessary modifications

to this immediate environment. The larger physical environment within which driving occurs also needs to be addressed, as its characteristics will support and/or impede mobility. The driving skills of the individual are another component of this person-environment transaction. The instrument must enable therapists and drivers to identify which skills are present and which need further training. Essentially, an assessment of community power-mobility driving is needed to assess the fit between the driver, the power-mobility device, and the larger environment, and to suggest ways in which this fit can be optimized through skill training, device modification, environmental modification, and advocacy to increase community accessibility. The term evaluation implies the possibility of failure. However, it should be noted that both the PIDA and the PCDA have been developed with an explicit a priori statement that they were not designed to assist health care professionals in deciding whether or not someone should have access to power-mobility but rather to assist professionals and drivers in determining particular areas where driver training, device adaptation, and/or environmental modification would be indicated.

The purpose of this study was to develop an assessment of power-mobility driving in the community. Three principles provided the theoretical framework for the construction of the PCDA. First, the assessment was to be explicitly oriented towards enhancing mobility rather than preventing access to power-mobility devices by potentially unsafe drivers. Second, in accordance with recommendations regarding outcome measures in rehabilitation, the instrument was to be designed to measure actual performance and not simply capability (Bombardier & Tugwell, 1987; CAOT, 1991). Third, the assessment was designed to reflect the diversity of driving requirements in the community, thus reflecting the statements of users of power-mobility devices (personal communication, P. Britton, L. Davy, M. Noell, Jan. 7, 1994).

METHODS

The process of the development of the PCDA was a collaborative one undertaken with clinicians and users of power-mobility devices. This collaboration was developed to fall in line with principles of the independent living movement and the concept of client-centred practice (Canadian Association of Occupational Therapists (CAOT), 1991; Woodill & Willi, 1992).

Prior to developing a proposal for funding of this project, the authors consulted three users of power-mobility devices about whether or not they felt that an instrument focused on power-mobility driving in the community would be useful. The investigators agreed a priori to discontinue the project if the users had indicated that such an instrument would not be of benefit. However, the users confirmed that the instrument could be useful in three ways. First, they felt that it could be valuable in relation to prescribing individuals' first power-mobility devices. Second, it was felt that the instrument would assist therapists and users in identifying specific areas for driving training, as some areas of driving are more difficult than others. Third, the instrument was felt to be potentially useful in sensitizing users to the more challenging areas of driving. By taking drivers into the community in familiar and unfamiliar environments, the instrument would help

clinicians and drivers to become aware of times when more caution is required when driving.

The investigators believed that such an assessment would be useful in three additional ways. The instrument would assist therapists and clients to select the power-mobility device that would provide clients with the optimal mobility by comparing driving with different devices in similar environments. As well, researchers investigating how mobility and its enhancement contribute to quality of life would be able to use the instrument as an outcome measure. Finally, engineers and designers developing modifications to power-mobility devices would be able to use the instrument as a standardized measure to compare the effects of modifications on mobility.

New assessments normally derive items from four sources: clinical observation, theory, research, and/or expert opinion (Streiner & Norman, 1989). Since there were no similar published assessments from which to draw items, items were generated based on theory, clinical observation, and expert opinion. Thus, the overall process for the development of the PCDA was to identify, a priori, the theoretical framework for the assessment, and to use a consensus method for the actual item generation (Fink, Kosecoff, Chassin, & Brook, 1984; Melzack, 1975). Participants involved in item generation were experts in power-mobility, both users of the devices, and clinicians involved with prescription and training with power-mobility drivers.

Using a nominal group consensus method, items were generated within the constraints of the principles established a priori. A nominal group process is a structured means to obtain information from people with expertise in a specific area (Fink et al, 1984). It begins with each member individually listing their own ideas, and then presenting their ideas (from highest priority) in a round-robin fashion. The compiled list is then reviewed by all members by having them rate or rank each item. The group's views are then compiled and evaluated by all members. This process continues until consensus is achieved.

Participants

Ten experts in power-mobility, representing a diversity of experiences, undertook the development of the PCDA. The group was made up of five users of powermobility devices (consumers) and five clinicians expert in prescribing power-mobility devices and training persons in using these devices. A sample of 10 is considered adequate for this type of nominal group process (Fink et al, 1984), although it is expected that the instrument will undergo revisions when it is further validated.

Of the ten participants, two were paid by their employers to participate in the process, and the others received honoraria for their participation. The five clinical experts were all occupational therapists who had prescribed a minimum of six power-mobility devices over the last 2 years and/or trained six people in the use of power-mobility. They brought to the table experience in rural and urban practice, community and institutional practice, and vending of powermobility devices.

The five consumer experts were all people who regularly drive power-mobility devices in the community, and none were in client relationships with the investigators or clinicians. One consumer was a resident of a long term care facility. Consumers were selected at the recommendation of those involved in the pre-proposal meeting and via contacts with various groups of persons with disabilities including the Canadian Paraplegic Association, and the Multiple Sclerosis Society. Four consumers used power wheelchairs, and one used a scooter. All had used power-mobility devices for at least one year.

Procedure

The investigators approached participants, explained the study, and asked for their participation. The nominal group process described by Fink et al. (1984) was used with some minor changes to accommodate the scheduling and transportation difficulties faced by many users of power-mobility. The process involved individuals generating items, compiling and ranking items generated, and assessing the compilation until consensus was achieved. To accommodate the participants' needs, some work was done by individuals at home, and five meetings were held. Prior to the first meeting, all participants received a mailing outlining the purpose and methods of the study, the theoretical principles for the instrument and the commitment required of them. Each meeting held with the participants is briefly described below.

Meeting 1. The first meeting was held to explain the purpose and process of the study, review the theoretical principles for the assessment, and describe the instrument construction process. The relationship between the PCDA and the existing PIDA (Dawson et al., 1994) was discussed at the meeting, and it was agreed that the PCDA could be viewed as a "sister" instrument to the PIDA. Before leaving, participants were provided with the theoretical principles, and homework: they were asked to generate and prioritize a list of items they thought should be included in the PCDA.

Meeting 2. Participants presented items in a roundrobin fashion until all were listed. After the meeting, the investigators compiled the list of items, and mailed them to participants who were asked to rate the relevance of each item. These rankings were returned to the investigators and compiled prior to the third meeting.

Meeting 3. Participants evaluated the relevance of each item, deleted items based on the ranking, and sorted the items into categories. The investigators then devised specific instructions for each item, and developed a proposed a scoring system. This material was circulated by mail to the participants for review.

Meeting 4. The participants brought their comments regarding the instrument, the instructions and scoring system, and developed a final draft of the instrument. Participants agreed to pilot the instrument (either themselves or with a client).

Meeting 5. Results of the pilot testing efforts were discussed, and revisions to the instrument then made.

Throughout the process of instrument development, the investigators acted as facilitators of the process, rather than as participants. The investigative team did not contribute to the item pool, or to the item ratings. It was felt that if the investigators had participated in this way, their pre-conceived ideas of the instrument's final format might sway the group process. The investigators did however ensure that the principles of the instrument's development (driver-centred, performance based) were maintained. As well, the investigators operationalized the items and developed the instructions for the items based on discussions held by the group.

The meetings were held over a period of eight months (from October 1994 - June, 1995). Two consumers were forced to drop out of the study because of illness. One was hospitalized and missed the last two meetings. Another became ill and died after the second meeting. One consumer missed the first meeting because she was unable to find wheelchair-accessible parking for her van, and missed a later meeting because she gained employment. The clinicians who participated were also unable to attend some meetings. One clinician was unable to attend one meeting because of other demands, and another missed part of a meeting because of a clinical emergency. Despite these occurrences, overall attendance at meetings by participants was over 80%.

RESULTS

The result of this process is the final version of the Power-mobility Community Driving Assessment. This final version consists of three parts: a pre-performance interview; a checklist regarding the mobility device and driver experience; and the performance assessment.

The pre-performance interview allows consideration of the potential uses of the power-mobility device in the community. A routine week is considered in terms of the locations to which drivers need to go. The drivers are asked to review the normal tasks they undertake in a typical week, the location, distance and time to get there, their typical route and method of transportation, environmental obstacles of which they are aware, and whether or not difficulty is anticipated in negotiating those obstacles. The drivers' need for accompaniment, either for mobility or personal care is discussed, as is their understanding of the rules of the road. Wheelchair safety accessories that are used and needed are also indicated. Finally, three questions focus on the driver's ability to explain or indicate how emergency situations would be dealt with.

The second section of the instrument, the mobility device and driver experience checklist, allows the driver and therapist to review factors that will influence the driver's performance during the performance assessment. This section focuses on both the type of device being used and its condition, and the driver's skill and ability to drive the device. For example, if the mobility device is a trial device, and the driver has recently acquired a disability and has never driven a power-mobility device before, these considerations can be built into what is assessed during the performance assessment, and a number of items might require further training.

The final section of the instrument, the performance assessment (see Figure 1) is is divided into six categories: general driving skills, wheelchair accessible public transit, wheelchair accessible private transit, driving with controls in different positions, driving on varied surfaces, and accessing public places. A number of items can be scored within each section. For example, when evaluating the driver's ability to access public places, a number of possible public places are listed (and blank items are also provided for completion by the therapist and driver). Examples include a store, a bank, and a restaurant. For each location, the driver's ability to approach the site, access the entrance and manoeuvre within the site are evaluated. The therapist or driver are requested to describe the type of approach (e.g., ramp with handrails), and entrance (e.g., double doors - no automatic opening), as well as details about the site when evaluating the driver's ability to manoeuvre within it. Sample items are included in figure 1.

The performance assessment is completed in two steps: relevant items are first selected, and the driver and therapist then conduct the assessment. The driver and therapist go through the instrument and discuss which parts are appropriate and feasible to assess. Once the items to be assessed are established, the driver and therapist will travel into the community and go through those items that have been deemed applicable. For each applicable item that is assessed, a four point scale is used (see Table 1) to score the driver's performance. The performance assessment may be completed over more than one session. The dates and weather conditions for each session are noted.

The PCDA was piloted by four of the participants to determine if the instructions were clear, and the administration time feasible for clinical purposes. Participants were asked only for comments rather than summary scores. All participants reported that on average, the instrument required between one and two hours to complete. The instrument provided them with the flexibility to evaluate driving skills in a variety of community environments, and to select the environment based on the needs of the driver. Participants felt that the scoring could be used to target areas where training may be needed, and/or where environmental modification (either of the mobility device or the community environment) may be warranted, that the PCDA could be applicable in institutional or community environments, and that it could be useful in the process of prescribing the appropriate power-mobility device, and in determining areas of driving that require training.

DISCUSSION

This study resulted in the development of the Powermobility Community Driving Assessment, a clinically useful assessment for describing and evaluating the driver-environment transaction for adults who use power-mobility devices in community settings. At this point, the instrument has face and content validation, but requires further pilot work to determine its usefulness as well as research on its reliability and validity. Participants in this study were uniformly enthusiastic about its clinical usefulness.

Because involving consumers in a research process is relatively new, it is worth discussing the methods used in this study. The consensus method is one that has been

used previously for the development of a variety of health measures. This method appears to be

Figure 1

Sample Items from the PCDA

	Applicable	Not Applicable	Not Assessed	Score
GENERAL DRIVING SKILLS:				
Driving in crowds.....	X			4
W/C ACCESSIBLE PUBLIC TRANSIT:				
Ramp: Getting On.....	X		X	
ACCESSING PUBLIC PLACES BANK				
* approach (describe) ramp, good slope	X			4
* entrance (describe) automatic doors	X			4
* manoeuvering - teller line.....	X			4
-teller desk.....	X			4
-insta-bank machine... too high.....	X			3
STORE (specify) - Hardware Store				
* approach (describe) slight slope	X			4
* entrance (describe) no automatic doors	X			3
* manoeuvering- between shelves and displays ..wide aisles.....	X			4
- exit turnstile (required staff assistance - lost patience).....	X			2

Table 1

Item Scoring for the PCDA

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4  Completely independent: optimal performance: able to perform task in
one
   attempt smoothly and
   safely.

3  Completes task hesitantly, requires several tries, requires speed
   restriction, and/or bumps wall,
   objects, etc. lightly (without causing harm).

2  Bumps objects and people in a way that causes harm or could cause
harm
   to driver, other persons or
   to objects.

1  Unable to complete task independently: reason:
   _____. For
   example, may require verbal and/or visual cues or physical
assistance.
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appropriate, particularly when there is little existing literature and few tools upon which to draw for possible items. As well, this instrument was developed with a group of people with diverse expertise. Incorporating the views of users of power-mobility devices as well as therapists who assess driving and prescribe power-mobility devices meant that multiple perspectives were brought to meetings. Despite the diversity, the group was able to come to consensus about the content and format of the instrument. Such a process supports the face and content validity of the instrument (Johnston et al., 1992).

The process used in this study provides insight into issues that other researchers may want to consider in relation to collaboration with consumers. Modifications were made to the group process to allow some of the work to be undertaken by participants without having them come to meetings. This plan was developed particularly to accommodate transportation difficulties faced by the power-mobility users. Since not all work was done together, all results were compiled and shared with members, so that all were aware of the contributions of others. This modification did not seem to interfere with the ability of the group to develop the instrument. In fact, it may have facilitated the development of the final product as participants were able to reflect on decisions and bring their thoughts to subsequent meetings for further discussion.

However, even with the modifications to the process, full attendance at meetings was not attained. Although both clinicians and consumers missed meetings, there was lower attendance by the power-mobility users because of factors beyond their control. These occurrences meant that the input from power-mobility users was less than that of the therapists, and for some members, it meant that they were absent when decisions were made by the group. However, with the exception of the participant who passed away, all members had an opportunity to comment on the final version of the instrument before its completion. When working with participants who may face more barriers to participation, as in this case, it may be worthwhile to engage more consumers in the process than professionals to ensure a balanced discussion during meetings.

In terms of the instrument itself, the initial principles related to its development have been met. The PCDA measures actual performance rather than capacity. It is undertaken in the driver's own environments, and it is driver-centred, in that the environments within which the assessment takes place are determined with the driver based on his/her identified needs. The results of the PCDA should provide the therapist and/or driver with information about the driver's ability to negotiate within a variety of environments, and should assist in the identification of driving skills that require more training, or modifications to the environment (the power-mobility device or the built environment) that would support the driving abilities of the driver. A comprehensive compilation of guidelines for adaptations to devices to accommodate specific disability-related needs may also be a useful companion manual to the PCDA at some point in the future.

SUMMARY

This paper has described the process used to develop a new instrument which will assist in the assessment of power-mobility driving in the community. The Power-mobility Community Driving Assessment was developed using a modified nominal group process, with participants including occupational therapists and users of power-mobility devices. The process used resulted in the development of a three part assessment which is driver-centred and based on the performance of drivers within their own community environments. Further psychometric testing of the PCDA is required.

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L objectif de cette etude etait de developper une evaluation de la conduite motorisee des adultes au sein de la communaute. Cet article decrit les methodes employees pour developper l'evaluation et aboutir a sa forme finale. L'Evaluation de la conduite motorisee communautaire (PCDA) a ete developpee a l'aide d une methode de consensus de groupe nominal modifiee. Parmi les dix participants se trouvaient des utilisateurs des moyens de

locomotion motorises ainsi que des cliniciens et cliniciennes ergotherapeutes possedant une expertise dans la prescription de moyens de locomotion motorises ou dans la formation assuree aupres des personnes pour les rendre aptes a s'en servir. Cet outil s'est developpe au cours d'une serie de cinq reunions completees dans l'intervalle par des travaux effectues par correspondance. Le PCDA s'est basee sur les performances reelles de conduite dans les milieux frequentes par l'utilisateur. Au cours du processus de developpement, la validite apparente et la validite de contenu ont ete etablies. Les tests pilotes effectues au depart confirment l'utilite clinique de cet instrument. Desormais, des travaux supplementaires pour evaluer les proprietes psychometriques du PCDA s imposent.

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