Development of a new mobility scale for people living in the community after stroke: Content validity

Elisa Stanko, Patricia Goldie and Margaret Nayler
La Trobe University, Melbourne

Mobility inside and outside the home, and in the community, is important to independence of lifestyle after stroke. Existing measures lack content validity relating to these three environments. The aim of this study was to contribute to the content validity phase of developing a new scale for assessing mobility of people with stroke in these settings. An open-ended questionnaire was used to obtain responses from 15 physiotherapists with substantial experience in neurological physiotherapy. Responses were coded to provide a comprehensive list of tasks and destinations. A wide range of destinations was identified for i) inside the home: bedroom, bathroom/toilet, living room, kitchen; ii) outside the home: access to and from property, outside buildings, clothesline, garden and letterbox; and iii) in the community: access to health and shopping facilities, leisure sites and public transport. Although a diverse range of tasks was identified, a common theme emerged to emphasise the impact of the environment on mobility. Responses were recorded in all dimensions of a recently published conceptual model of mobility that focused on environment. These dimensions included distance, time constraints, ambient conditions, terrain characteristics, external physical load, attentional demands, postural transitions and traffic level. Further work is required to quantify environmental dimensions which are relevant to the destinations identified in the three environmental settings of this study. **[Stanko E, Goldie P and Nayler M (2001): Development of a new mobility scale for people living in the community after stroke: Content validity. *Australian Journal of Physiotherapy* 47: 201-209]**

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Introduction

Mobility is defined as "the individual's ability to move about effectively in his surroundings" (WHO 1980). After stroke it is common to have sensorimotor, perceptual and cognitive impairments that affect mobility. Of particular importance is the level of mobility inside and outside the home environment, as this is a common destination after discharge from rehabilitation (Thorngren et al 1990). Mobility inside and outside the home is essential for basic activities of daily living and independent living, such as cooking and laundry. Mobility in the community is also a goal for many people after stroke (Bohannon et al 1988). It is in this wider environment that instrumental activities of daily living, such as shopping and attending to health problems, take place. Access to the wider community is also required for social and leisure activities. Thus, mobility inside and outside the home and in the community is fundamental for restoring independence and quality of life after stroke. Given the importance of mobility after stroke, the focus of this study was to investigate appropriate methods of measuring mobility in these three environments.

There are several reasons to measure mobility in the home and community following stroke (van Bennekom et al 1995). Firstly, it is important to screen people when they return home to detect whether they have mobility deficits in their usual environments. The detection of deficits may mean that further rehabilitation services are required to optimise the independence of lifestyle or that home care services are required to prevent undesirable outcomes such as falls. Secondly, it is important to be able to measure mobility over time to detect improvement or deterioration. The measurement of change provides a rationale for whether rehabilitation services should be continued. Thirdly, the systematic measurement of mobility in the home and community after stroke provides benchmarks which can be used to compare across different levels of service provision and for setting treatment goals. Currently, this type of information appears to be lacking. Finally, the documentation of mobility outcomes after discharge is necessary to demonstrate treatment effectiveness and efficacy to funding agencies and the users of such services. Physiotherapists need a reliable and valid method of measuring mobility in the home and community settings. Valid and reliable measurements are vital in today's health system, which is demanding an increasing level of accountability and which is shifting the resources from a hospital-based system to a home-based system for stroke rehabilitation.

The content validity of the current scales is inadequate for measuring mobility after stroke in the home and community settings. Existing measures can be divided into several categories. One group contains instruments that are typically referred to as impairment scales. These scales are designed to measure generalised motor function, for example the Fugl-Meyer (Fugl-Meyer et al 1975) and Chedoke-McMaster Stroke Assessment (Gowland et al 1991). These instruments assess the ability to perform active movements and rapid movements, as well as joint pain and sensation. Although these impairments may

adversely affect mobility, this approach does not provide a method for measuring mobility as such in the home and community settings.

The most common set of outcome measures are those that measure basic self-care activities such as dressing, showering, toileting, basic transfers and locomotion. Examples include the Barthel Index (Mahoney and Barthel 1965), the Functional Independence Measure (Granger et al 1986) and the Kenny Self-Care Evaluation (Schoening et al 1965). These instruments are designed to assess patients' abilities to perform simple self-care activities. They do not include items for measuring more complex activities related to mobility, which are necessary for independence of lifestyle after stroke in the home and community settings.

More recently, a number of outcome measures have been developed for assessing instrumental activities of daily living. These scales include items that go beyond basic self-care skills to those representing outdoor and community based activities. Examples include the Frenchay Activities Index (Holbrook and Skilbeck 1983) and the Extended Activities of Daily Living Scale (Nouri and Lincoln 1987). Instrumental activity of daily living scales are designed for assessing peoples' abilities to carry out a broad range of activities across several domains, including mental, interpersonal and social domains. Since they are not designed to focus entirely on mobility, they do not include items for measuring the more complex community-based mobility activities. In contrast with the previous instrumental activity of daily living scales, one published scale, the Rivermead Mobility Index (Collen et al 1991) was designed to focus entirely on mobility in the home and community after stroke. However, this scale is limited to 15 items and includes only three outdoor items: walking on pavement, walking on uneven ground and running. The other 12 items represent very basic mobility activities such as transferring from lying to sitting, transferring from bed to chair and standing unsupported. Therefore, the Rivermead Mobility Index lacks sufficient items to represent the complex domain of community-based activities required for mobility after discharge from rehabilitation.

A community mobility index has been used after traumatic brain injury (Hillier et al 1997). This scale included using a wheelchair; walking on level, irregular surfaces and stairs; running; jumping; hopping; crossing a road; driving a car; and using public transport. Although this scale incorporates more items than the Rivermead Mobility Index, it may not be relevant to the stroke population, which is generally older than the population with traumatic brain injury. Therefore, a scale needs to be developed to take into account the types of activities required of people who have had a stroke.

Another group of scales provide broad classifications of walking disabilities. These include the Functional Ambulation Categories (Holden et al 1986) and the Modified Functional Walking Categories (Perry et al 1995). These scales are designed to place people into categories such as physiological walker or community walker and do not contain items for measuring restricted mobility abilities. They are useful for describing the level of function of groups and for detecting major changes in the home and community, but are less likely to detect more subtle, yet clinically significant changes. Furthermore, these scales do not take into account more complex environmental factors such as walking on uneven surfaces, in different lighting conditions or while performing other tasks such as talking or carrying objects. These are important factors influencing mobility in the home and community settings.

Recently, there has been a proliferation of instruments that measure health-related quality of life. Examples include the Short Form-36 (Ware and Sherbourne 1992) and Nottingham Health Profile (Hunt et al 1980). Health-related quality of life scales are designed to measure the broader concepts of life, for example employment, mobility, economic and mental health domains. Justifiably, they cover several domains of health which were previously measured by the one instrument (eg a mobility or mental health measure). Clearly, quality of life scales are not specifically designed to measure mobility in the home and community settings.

This review of the literature indicates that there is a need to develop a scale that specifically measures mobility in the home and community settings for people after stroke. This scale needs to satisfy the requirements of reliability and validity as stated by the Task Force on Standards for Measurements in Physical Therapy (1991). It is important that the items contributing to a new scale are valid for the purpose of the scale and for the intended population. Content validation should occur throughout the construction of a new scale (Striener and Norman 1995). To ensure content validity, new items should be based on the judgments of patients, experts, potential users, health professionals and lay individuals (Streiner and Norman 1995, Wood-Dauphinee et al 1994). Once an initial comprehensive item pool has been devised, the most important items must then be selected (Streiner and Norman 1995). In this first step of developing a new measure, physiotherapists were surveyed.

In summary, the aim of this study was to establish initial content validity of a new scale for measuring mobility of people living in the community after stroke. The first step in this process of establishing content validity was to administer a questionnaire to physiotherapists with expertise in neurological physiotherapy.

Method

Subjects Physiotherapists were recruited from 10 different settings within the neurological physiotherapy field, including public and private rehabilitation hospitals, private practice clinics, and the home and research settings. Physiotherapists were recruited through personal contacts

if they satisfied the following criteria: 1) physiotherapists at Grade 2 or 3 level with expertise in neurology; 2) a minimum of five years experience in stroke rehabilitation; and 3) currently practising in the field. Fifteen highly experienced physiotherapists (13 females, two males), with a mean age of 34 years (SD = 5.4, range = 28-50) and a mean of 10 years experience in neurological physiotherapy (SD = 3.7; range = 5-18) participated in the study.

Instrument An open-ended questionnaire was designed to investigate what items are important to include on a new outcome measure of mobility in the home and community for people after stroke. Mobility is a complex concept that consists of attributes that are not always directly obvious. However, logic dictates that one's ability to carry out certain mobility tasks and access destinations within the home and community can be used to make inferences about their mobility level. Therefore, an open-ended questionnaire was designed to elicit opinions on which tasks and destinations are important to include on a new outcome measure. The rationale for the questions was based on a literature review of mobility outcome measures. This review revealed that items on current measures typically referred to two aspects of mobility: i) the ability to perform tasks, for example negotiating stairs and walking outside (Collen et al 1991, Schuling et al 1993); ii) the ability to access destinations within the home and community, for example, visiting the local shop (Nouri and Lincoln 1987, Schuling et al 1993). The questionnaire was designed to ask which tasks and which destinations are important for mobility inside the home, outside the home, and in the community.

Several operational definitions were used in this study. Mobility was defined as "the individual's ability to move about effectively in his surroundings" (WHO 1980). "Inside the home" was defined as the environment inside the front door. "Outside the home" was defined as the environment outside the front door and within the perimeter of the private property. Lastly, "the community" was defined as the environment outside the perimeter of the private property. Several standard prompts for each question were devised to assist subjects if they misunderstood the question.

Three colleagues examined drafts of the questionnaire to ensure completeness, clarity, and applicability. Few minor revisions were made. According to correct procedures for designing questionnaires (Bailey 1987, Portney and Watkins 1993) the final draft was pre-tested by an expert physiotherapist and final minor revisions made.

Procedure Approval was obtained from the Ethics Committee of La Trobe University. Prior to data collection, the procedures were described and informed consent was obtained.

Questionnaires were administered individually to subjects in standardised face to face interviews. Subjects were issued copies of the open-ended questionnaire and provided with the operational definitions of mobility inside the home, outside the home and in the community as previously described. Subjects were advised that standard prompts for each question could be provided if they were unsure about the question. To ensure that a comprehensive range of responses were reported, subjects were also advised that they could include any standard prompt given, if they considered it to be an important response to the question. Two subjects required prompting on the same question. The interviewer read each question aloud to the subject, who was then instructed to record their responses onto their copy of the questionnaire.

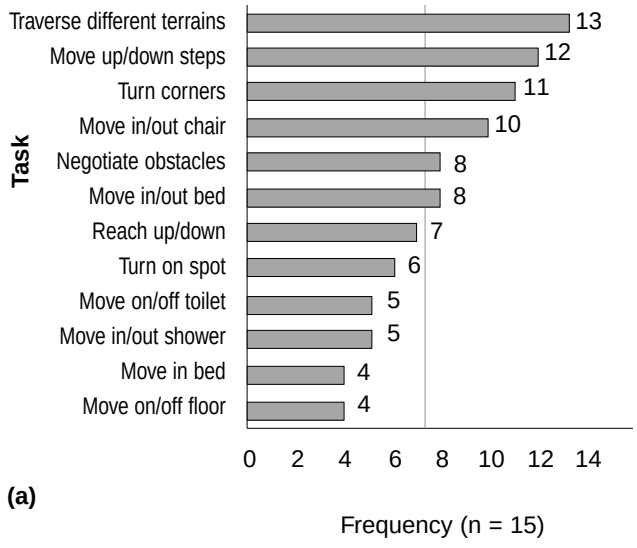
Analysis There were complete data from all 15 questionnaires. Data from open-ended questionnaires are typically plentiful, disordered and must be reduced and organised for analysis (Miles and Huberman 1994, Portney and Watkins 1993, Strauss 1987). A common qualitative research method called coding was used for this process (Miles and Huberman 1994, Strauss 1987). This method is based primarily on the inductive approach, which implies that patterns, themes, and categories emerge from data without pre-existing expectations on what important dimensions will be (Strauss 1987). Coding involves systematically categorising data to reduce size, impose order, uncover common responses and provide labels for data analysis (Strauss 1987), using data category cards (Strauss 1987). These large cards included the question as it appeared on the questionnaire as well as all the responses from that question. Responses from data category cards were then reviewed and categories were designed according to common themes or similar responses. Codes consisting of letters that were semantically close to categories were then designed and matched accordingly. The frequency of responses was obtained from coded survey data.

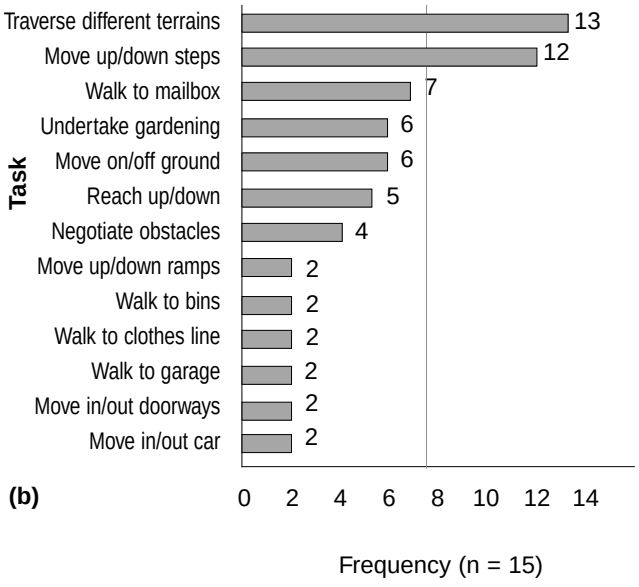
Coding requires enormous amounts of time and effort and should be carried out by independent persons to avoid bias (Strauss 1987). A highly experienced physiotherapist with a working career of more than 40 years, and who was not associated with the design of the project, volunteered to undertake this task. The purpose of the study was explained to this physiotherapist and informed consent was obtained. An instruction sheet explaining the coding process was designed and a training session was held.

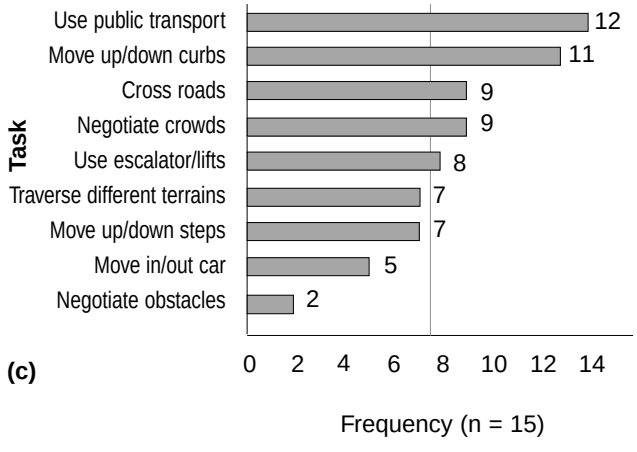
Results

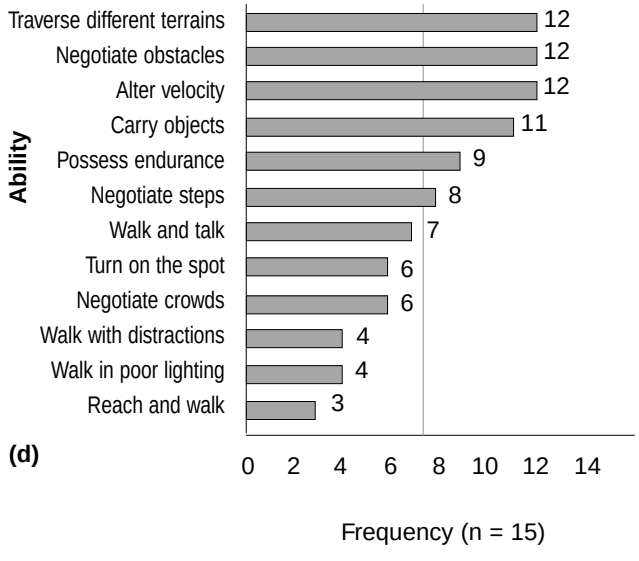
A wide range of responses was received for each question. Therefore, categories with fewer than two responses were omitted in Figures 1 to 7. These Figures show the frequency of responses from the 15 physiotherapists for each question in the open-ended questionnaire.

Inside the home, the majority of physiotherapists included getting in and out of bed and a chair; going up and down stairs; negotiating obstacles; turning corners; and traversing different surfaces (Figure 1a). Outside the home, the majority included moving up and down steps and negotiating different surfaces (Figure 1b). In the









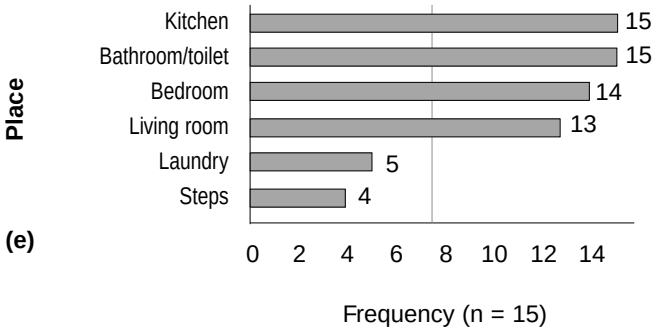
community, the majority included accessing public transport; lifts and escalators; crossing roads; moving up and down kerbs; and negotiating crowds (Figure 1c).

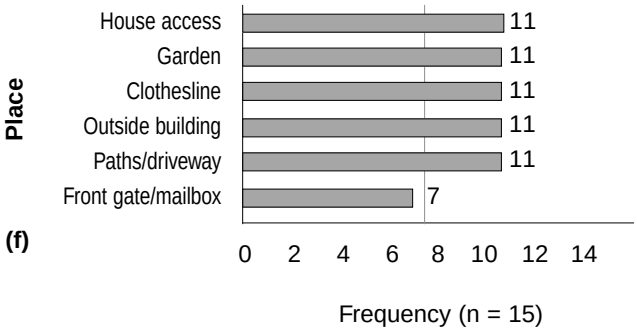
The physiotherapists reported several additional mobility tasks essential for mobility in all environments. These include the ability to negotiate different surfaces, obstacles, steps and slopes; carry objects; alter speed when walking; and walk distance (endurance) (Figure 1d).

Inside the home, the majority of physiotherapists report that access to several destinations was important for independent mobility. These are the bedroom, bathroom and toilet, living room and kitchen (Figure 1e). Outside the home, the majority included access to the house, paths and driveways, outside buildings, clothesline and garden (Figure 6). In the community, the majority included access to paths, crossings and roads, social and leisure sites, local shops and public transport (Figure 1g).

Discussion

The results of this study have highlighted the complexity of tasks and the diverse range of destinations that are perceived to be important for mobility inside and outside the home and in the community setting. At one end of the continuum were tasks that are essential to basic activities of daily living such as transfers to bed, chair, toilet and shower. These mobility tasks require skills in negotiating





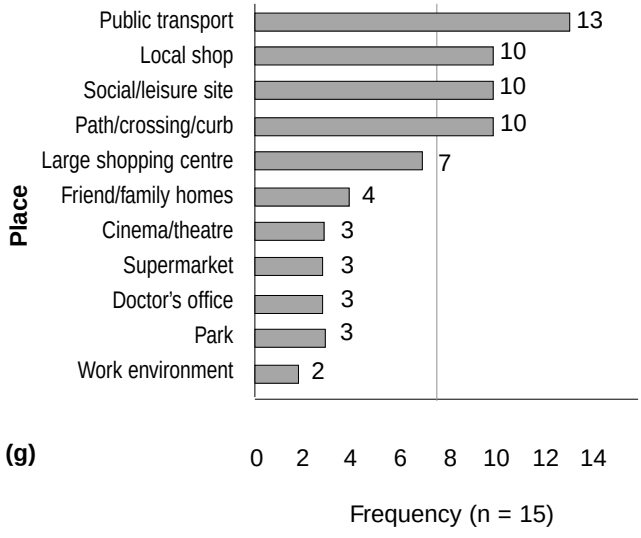


Figure 1. Reponse to question about:

(a) important mobility tasks inside the house;

(b) important mobility tasks outside the house;

(c) important mobility tasks in the community;

(d) additional mobility abilities required for independent mobility in the house and community;

(e) important places to access inside the home;

(f) important places to access outside the home;

(g) important places to access in the community.

very constrained and specific environmental conditions. It was also recognised that mobility in the home involved access to different rooms of the house: bedroom, bathroom, toilet, living room and kitchen. Such access requires skills in negotiating the environment resulting from the design features of the home such as terrain characteristics (different floor surfaces and steps), architecture (turns) as well as home contents such as furniture (turns) and personal possessions (obstacles).

In the environment outside the home there was also a high level of agreement about the importance of negotiating different terrain characteristics such as steps and floor surfaces. Destinations outside the home were associated with activities of daily living such as access to and from the property, laundry, gardening, rubbish disposal and mail collection.

In the wider community, tasks involved ability to negotiate more complex terrain characteristics such as steps, kerbs, obstacles and different outside ground surfaces. There was general agreement that ability to use public transport was an important mobility task for function in the wider community. This involves a complex interaction of abilities. For example, in order to take public transport, longer distances are likely to be involved, terrain characteristics may include steps or ramps and time constraints can be involved such as stepping on and off an escalator or stepping onto a bus. The ability to perform the required task within a crowded situation also makes the task more complex. Destinations in the community reflected recreational and social activities as well as instrumental activities of daily living such as accessing shops or health facilities. From these descriptive data it can be seen that the environmental context for mobility could range from a relatively stable and familiar environment in the home setting to unpredictable conditions in the wider community.

It is interesting to note that some of the tasks were weighted differently, according to the environmental setting. For example, the three items of steps, obstacles and different surfaces were weighted at a lower level in the community than in the other two settings. This may have occurred due to the importance placed on other more complex tasks in the community, such as crossing roads, negotiating kerbs and gutters and taking public transport. Alternatively, the decreased emphasis on these three items may have occurred because more choice exists in the community to avoid these aspects of the environment. Further research is

required to investigate whether these aspects of the environment are considered less important, thereby re-weighting their importance, if the person is to gain a high level of mobility in the community after stroke.

The range and complexity of these tasks and destinations highlight the inadequacy of the current measurements of mobility in the home and community settings. Even the most comprehensive of the existing scales, the Rivermead Mobility Index, does not contain sufficient items when viewed in relation to the responses given in this study. In order to have content validity, it appears that a new scale is required for mobility in these three settings. The new scale needs to represent the diversity and complexity of the responses obtained in the current study.

Due to a paucity of existing studies on this topic, it is difficult to compare the results of the current study with other findings. However, it is useful to compare the responses from this questionnaire with a recently published conceptual model outlining several dimensions of mobility (Patla and Shumway-Cook 1999). This paper was published after completion of the current study and therefore did not influence the respondents. The impetus for the development of this conceptual model also arose from the inadequacy of the current scales in taking into account the important role of the environment in defining mobility (Patla and Shumway-Cook 1999). Eight dimensions have been included in the model: distance, time constraints, ambient conditions, terrain characteristics (surfaces with different geometric characteristics such as steps and kerbs and surfaces with different physical properties such as compliance and friction), external physical load, attentional demands, postural transitions and traffic level. The respondents in the current study identified items in each of these dimensions. When asked about additional mobility abilities required for independent mobility in the home and community, the physiotherapists specifically identified a range of tasks in which the environment plays a major role. These environmental factors included: distance such as that required for outdoor tasks; time constraints such as altering speed to cross roads; ambient conditions such as poor lighting; terrain characteristics with different geometric properties such as steps and kerbs; terrain characteristics with different physical properties according to friction and compliance; external physical loads such as carrying objects; attentional demands such as walking with distractions or whilst talking; postural transitions such as turning; and finally traffic level such as walking in crowds, taking public transport and crossing roads. The responses of the current study highlight the important role of the environment in defining mobility.

Other researchers have emphasised the important role of the environment. Physiotherapy practice has been influenced by Gentile (1987) who proposed a taxonomy of tasks in which environmental context is a key component. Using this model, emphasis has been placed on the importance of training flexibility of movement patterns within different environmental contexts in the movement science method of treatment (Carr and Shepherd 1987a, Carr and Shepherd 1987b). This method is used widely by physiotherapists in Australia (Carr et al 1994). Bassille and Bock (1995) also emphasised the importance of specifically training mobility within relevant environmental contexts. Therefore, it is not surprising that the responses of the physiotherapists were strongly influenced by the environmental context of the three settings used in the current study. The newly proposed model by Patla and Shumway-Cook (1999) provides a framework for physiotherapists to carefully quantify specific aspects of environments which are relevant for mobility in the home and community settings. Such data have the potential to optimise training of mobility prior to discharge from the hospital setting (Bassille and Bock 1995, Carr and Shepherd 1987a, Carr and Shepherd 1987b, Gentile 1987).

There were some common responses across the three broad categories used to delineate the environment in this study. These included negotiating steps, different surfaces and obstacles. However, it is important to note that these tasks can vary greatly depending on each environment. For example, inside the home, surfaces can vary from compliant carpet to wet slippery tiles. Outside the home, surfaces may vary from even pathways to uneven and compliant grassy surfaces. In the wider community, surfaces are likely to be less familiar or predictable. For example, the floor surface in the supermarket, although flat and even, can be slippery and potentially dangerous. Complexity increases even more when several factors interact. For example, a grassy surface is more difficult to negotiate when on a slope, and even more difficult when it is wet. Therefore, while this study has generated comprehensive initial data on what items are important to include in a new measure, as pointed out by Patla and Shumway-Cook (1999), consideration needs to be given to the interaction occurring between the different environmental dimensions.

Although some commonality was found across the three environmental settings, responses generally varied according to the complexity of the environment. This finding highlights the challenge of finding a method of measuring mobility across such diverse environments. One of the fundamental properties required of a measurement scale is responsiveness (Wood-Dauphinee et al 1994). It will be important to be able to measure deficits or clinically important changes (improvement or deterioration) in mobility for an individual who is able to live independently at home with support services, but is generally restricted to walking inside the home. For example, the level of support services may need to be decreased or increased according to ability to perform basic transfers to bed, chair and toilet. In contrast, for individuals who can access the wider community, it will be important to measure deficits or clinically important change affecting independence of lifestyle, such as ability to attend the doctor's office, shop in the supermarket or use public transport. A method of measuring change and identifying problems needs to be

able to discriminate at both ends of the continuum of items which represent mobility. It remains to be seen if this can be achieved in a single scale or if separate scales are required according to the environmental context. The findings of the current study have provided some initial information about the range of items required in a scale representing mobility in the home setting and community.

There was some overlap in responses to the two questions involving tasks and destinations. For example, when responding to the question about mobility tasks outside the home, several of the responses involved walking to specific destinations. Other responses to this question involved environmental features. This problem can be overcome by using the model proposed by Patla and Shumway-Cook (1999) to build profiles of the environmental features influencing mobility in each of the three settings. The value of the current study lies in the identification of the places in the three environments. In this study, physiotherapists identified that in the home setting, access is commonly required to the bathroom, toilet, bedroom, kitchen and living room. But the environmental features relevant to these mobility tasks have not been identified. Likewise, the environmental features relevant to mobility outside the home for tasks such as mail collection, rubbish disposal or access to car have not been identified. Furthermore, the environmental features impacting on the ability to access community facilities such as shops or public transport need to be defined. The places identified in the current study can be used to guide this line of research.

External validity The findings of this study are generalisable to similar conditions. The sample of subjects in this study was drawn from experienced physiotherapists from 10 settings within the neurological physiotherapy field. The sample size of 15 can be considered adequate for such a study (Streiner and Norman 1995). The findings of the current study represent the first step in the validation process for a mobility scale for people who have had a stroke. Further work is needed to investigate responses from other health professionals, the clients and their carers (Streiner and Norman 1995). Information from such other groups will assist in formulating a comprehensive list of destinations in the three environmental settings.

It also needs to be recognised that this study focused on mobility after stroke. However, the responses from this study may also be relevant to other target groups such as young people with traumatic brain injury or elderly people who have had fractures or joint replacement, or those at risk of falling. In other clinical groups, the items may need to be re-weighted according to the needs of the clients. Many of the destinations in the home and community settings are likely to be generalisable to other target groups. Further research is needed to quantify the environmental features of these destinations.

Conclusion

This study has provided responses from 15 physiotherapists with expertise in the neurological field about items relating to mobility of people in the home setting and community after stroke. The findings highlight the diverse range of items needed to adequately describe mobility in these settings. The important role of the environment was emphasised with responses in all eight dimensions of a recently published conceptual model (Patla and Shumway-Cook 1999). In assessing mobility, consideration needs to be given to the interaction between different aspects of the environment and the relative weighting of responses according to environmental context. The diverse range of responses highlight the inadequacy of existing scales for measuring mobility in the home and community settings for people after stroke, hence supporting the need for a new scale. Further work is required to investigate content validity of a mobility scale with other professional groups and the patients and carers themselves.

Authors Dr Patricia Goldie, School of Physiotherapy, La Trobe University, Bundoora, Victoria 3083. E-mail: p.goldie@latrobe.edu.au (for correspondence). Elisa Stanko, School of Physiotherapy, La Trobe University, Bundoora, Victoria 3083. Dr Margaret Nayler, School of Physiotherapy, La Trobe University, Bundoora, Victoria 3083.

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