In-Home Occupational Performance Evaluation (I–HOPE)

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KEY WORDS
- activities of daily living
- environment
- home care services
- psychometrics
- reproducibility of results
- task performance and analysis

OBJECTIVE. We describe the development and preliminary psychometric properties of an assessment to quantify the magnitude of an environmental barrier's influence on occupational performance.

METHOD. The assessment was developed and then piloted on a group of 77 older adults before and after an occupational therapy intervention focused on environmental barrier removal. Refinements were made to the assessment before it was evaluated for interrater reliability in a sample of 10 older adults using 2 raters.

RESULTS. The In-Home Occupational Performance Evaluation (I–HOPE) is a performance-based measure that evaluates 44 activities in the home. The 4 subscales of Activity Participation, Client's Rating of Performance, Client's Satisfaction With Performance, and Severity of Environmental Barriers are sensitive to change in the environment. The subscales' internal consistency from .77 to .85, and intraclass correlation coefficients ranged from .99 to 1.0.

CONCLUSION. This preliminary study suggests that the I–HOPE is a psychometrically sound instrument that can be used to examine person–environment fit in the home.

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The United States is facing the prospect of caring for one of the largest populations of older adults ever to live in our society. By 2030, the number of older Americans will have more than doubled to >70 million (Administration on Aging, 2001). Many of these community-dwelling older adults experience chronic health conditions and are at significant risk for disability. As the elderly population continues to grow, it will make increasing demands on medical and social services. Critical gaps exist in our knowledge about how to manage the health needs of adults aging with disabilities.

The *International Classification of Functioning, Disability and Health* (World Health Organization, 2001) describes participation in daily activities as an interaction between people's abilities and the contexts in which they live. The demands of the environment (e.g., high bathtub rim) will determine the extent to which a person's functional limitation (e.g., mobility impairment) is disabling (e.g., inability to bathe independently). Conversely, it may be possible to use environmental supports to compensate for functional loss, thus improving performance in activities of daily living (ADLs) and instrumental activities of daily living (IADLs). However, studies that have focused on preventing disability have given little attention to the influence of the environment on health and functioning (Satariano, 1997), despite promising work that environmental intervention can influence health and functional abilities (Gitlin & Corcoran, 1993; Gitlin, Corcoran, Winter, Boyce, & Hauck, 2001; Mann, Ottenbacher, Fraas, Tomita, & Granger, 1999).

One reason for this lack of evidence is the inability to measure the consequences of an incompatibility between a person's abilities and the environment. Current assessments do not effectively evaluate the person–environment misfit of older adults and their homes. Instead, most assessments view the person,

environment, and task as separate and distinct entities or do not even include the environment in the evaluation process (Pollock, 1993). The environmental assessments that do exist do not adequately assess the activities vital to older adults aging in place. Two commonly cited assessments are the Housing Enabler (Iwarsson & Slaug, 1991) and the Safety Assessment of Function and the Environment for Rehabilitation (SAFER; Chui, Oliver, & Letts, 2001). The Housing Enabler promises to predict problems arising as a consequence of functional limitations and barriers in the home by first assessing clients for 15 possible functional limitations and then checking the environment for 188 different barriers identified as being associated with clients' functional limitations. Thus, the Housing Enabler yields a prediction of accessibility problems, not of actual occupational performance. The Housing Enabler can be administered without assessing the person interacting with his or her home environment (Iwarsson & Isacsson, 1999), which is convenient for screening potential housing options for people; however, the Enabler may fail to recognize the unique individual abilities discovered during the observation of performance in situ.

The SAFER is an environmental assessment that was originally designed for a psychogeriatric population but has since been expanded for use with people with physical disabilities. Its 97 items measure 14 domains to identify safety concerns for community-dwelling older adults (Chui et al., 2001). Although the instrument was designed using an occupational performance model, scores on the SAFER may not link directly to independence in ADL and IADL tasks (Letts, Scott, Burtney, Marshall, & McKean, 1998). Although the SAFER offers an important focus on safety features, it does not offer a quantifiable outcome for person–environment fit.

The lack of performance-based assessments that evaluate function in relation to the environment has been a longstanding problem for clinicians and researchers. Psychometrically sound ADL–IADL assessments that consider the client's perspective and satisfaction are needed (Law, Baptiste, Carswell, Polatajko, & Pollock, 1994) while recognizing the role of the environment in performance. The In-Home Occupational Performance Measure (I–HOPE) was developed to fill this gap by targeting activities performed in the home that are essential for aging in place.

Method

This study consisted of two phases: (1) developing the items and scoring procedures and testing and refining the instrument and (2) testing the instrument's interrater reliability. Each phase of the study was approved by the Washington University School of Medicine's Human Subjects Research Protection Office.

In Phase 1, 77 volunteers who had participated in a study of home modifications were evaluated using the I–HOPE battery. In this prospective cohort study, the measure was administered at two time points: before and after a home modification intervention. During Phase 2, a convenience sample of 10 volunteers was recruited from a community agency. Each participant was evaluated in his or her home by two clinicians.

Phase 1

Item Development and Content Validity

A previous pilot study of home modifications (Stark, 2004) established that once older adults had given up an activity because of an environmental barrier, they no longer identified the activity as a potential target for intervention. To address this problem, we decided to use a method previously successful in measuring the activity patterns of older adults (Baum & Edwards, 2001; Everard, Lach, Fisher, & Baum, 2000) that inventories current and desired activity patterns using photographic images as visual cues.

We began by developing a list of activities typically performed by older adults in the home. Basic ADLs, IADLs, and leisure activities were included. The items were derived from a review of clinical records of a home modification treatment program and from a review of the literature. Content analysis on >200 clinical records was conducted to generate a list of activities that occur in the home. A pool of 38 activities were identified and included in the I–HOPE.

Next, we prepared photographic cards depicting the activities. The photographs served as a visual cue to recall current and previous participation in the activity. To verify that the images on the cards were an accurate representation of the activity, we asked three laypeople unfamiliar with the project to review a set of cards without labels. Each person was asked to describe the activity represented. Images were modified, and the exercise was repeated until all three reviewers accurately identified the activity.

We then developed a multistep assessment procedure to establish current activity patterns, identify activities that were difficult but important to the older adult, and identify the environmental barriers that influence specific activities. For the first step, we created a sorting scheme to reflect the older adults' current activity performance patterns. Using a sort technique (Valenta & Wigger, 1997),

the activity cards were sorted into four categories: (1) *I do not do—don't want to do,* (2) *I do now with no problem,* (3) *I do now with difficulty,* and (4) *I do not do but wish to do.*

To calculate an activity score, we followed the approach used with the Activity Card Sort (Baum & Edwards, 2001; Everard et al., 2000). The score is a proportion of difficult activities divided by the total number of activities that the person needs or wants to do. The total number of activities (termed the *base activity score*) was computed by first assigning a score of 1 to each "do now," "do with difficulty," or "do not do but wish to do" card from the sort. The base activity score was computed as a sum of these scores. Next, we calculated a difficulty-with-activity score by assigning a value of 0 to the activities participants did not do but wished to do, 0.5 to the activities participants did with difficulty, and 1 to activities that posed no difficulty. The difficulty-with-activity score was the sum of these scores. The activity participation score was calculated as a proportion of the difficulty-with-activity score divided by the base activity score. We did not include activities that participants categorized as *do not do and do not wish to do* in the calculation, eliminating a penalty to people who participated in fewer activities.

The next step in the process was to focus on the subset of activities from Categories 3 (*I do now with difficulty*) and 4 (*I do not do but wish to do*). The participant ranked the problematic activities from most to least important and rated the problems ranked as most important (up to 10). We used an unweighted goal attainment scaling approach (Stolee, Zaza, Pedlar, & Myers, 1999) to measure subjective performance and satisfaction with performance. The Canadian Occupational Performance Measure anchor points of 1 (*not able to do it*) and 10 (*able to do it extremely well*) were used to rate performance; 1 (*not satisfied at all*) and 10 (*extremely satisfied*) were used to rate satisfaction (Law et al., 1994). A mean score was calculated for performance and satisfaction.

The third and final step in the process was a performance-based assessment of the older adult performing the activity in the relevant environmental context. To determine the magnitude of the barrier's influence on performance, we used an approach similar to those of the Home Assessment Profile (Chandler, Duncan, Weiner, & Studenski, 2001) and the Enviro-Functional Independence Measure (Steinfeld & Danford, 1997). In this approach, the therapist observed the participant performing the activity, identified the environmental barrier or barriers, and rated the influence of the barrier or barriers on performance. Barriers were scaled to measure whether the barrier resulted in 0 (*no activity*), 1 (*total dependence on another to complete the task*), 2 (*moderate assistance needed*), 3 (*minimal assistance needed*), 4 (*standby assistance needed, safety risk or extreme energy expenditure*), and 5 (*independent with or without a device*). The sum of each score yielded a total barrier severity score.

In summary, the I–HOPE uses a multistep assessment process to (1) identify activities that are difficult or impossible to perform in the current context, (2) prioritize and subjectively score activities that are most important to the person, and (3) determine the magnitude of the environment's influence on performance of the activity. Four subscores can be derived from the assessment. An activity participation score is derived from the sort, performance and satisfaction scores are derived from the rating session, and a severity-of-environmental-barrier score is derived from the performance-based assessment. The process is shown in Figure 1.

Internal Consistency, Convergent Validity, and Responsiveness of the Instrument

Participants. Between January and August 2003, 458 older adults age 60 or older participated in a cross-sectional study regarding their service needs (Carpenter et al., 2007). At the conclusion of an in-home interview, participants were screened to identify those who had difficulty completing ADLs, had poor physical health, used assistive devices, or had a history of falling in the home. The participants who reported difficulty in these areas were invited to take part in the home modification study. Eighty older adults agreed to participate in this study.

Of the 80 adults enrolled, 77 completed the pretest, and 67 participated in the postintervention assessment. We compared baseline scores for key variables including age, gender, income, marital status, and functional performance scores for the participants who dropped out of the project after pretest with those of the remaining participants. No significant differences existed between the groups. Baseline characteristics of the final sample are shown in Table 1.

Measures. We obtained the participants' sociodemographic characteristics. Problems with body function, environment, and performance were assessed via a battery of standardized assessments. We assessed vision (Lighthouse Near Acuity Vision test; Elam, 1997), mobility (Get-Up and Go test; Mathias, Nayak, & Isaacs, 1986), and cognition (Short Blessed Memory Test; Katzman et al., 1983). Strength and range of motion of the upper extremity were assessed using group muscle tests and goniometry, which were scored as within normal limits, within functional limits, or impaired (Radomski & Trombly Latham, 2008).

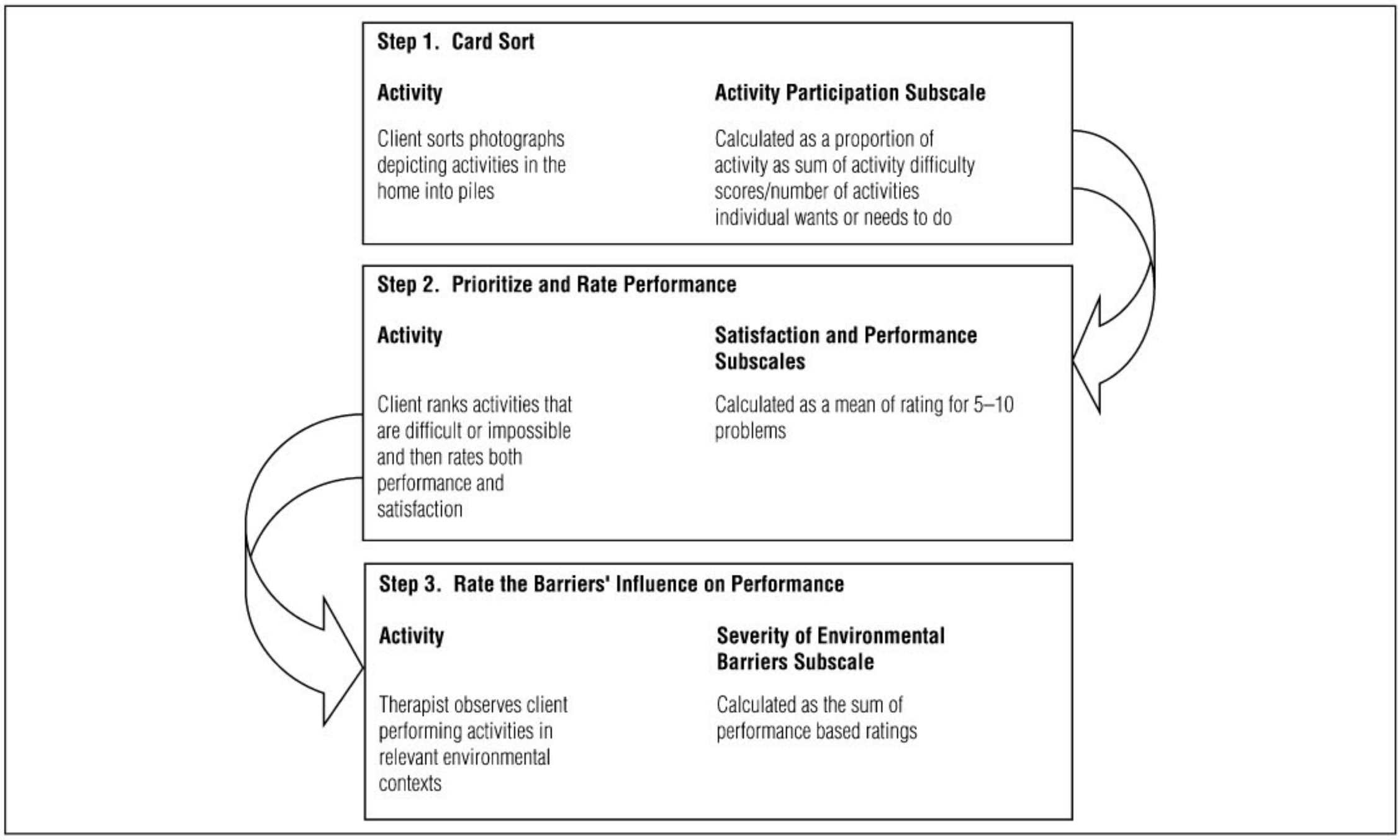

Figure 1. The In-Home Occupational Performance Evaluation (I–HOPE) process.

The FIM® was used to measure functional performance in motor and cognitive domains (Keith, Granger, Hamilton, & Sherwin, 1987). The I–HOPE was conducted to examine activity patterns, performance and satisfaction, and person–environment fit.

Procedures. Before participants' enrollment in the study, an initial visit was scheduled to provide verbal and written information regarding the study parameters, answer questions regarding the purpose and scope of the project, and obtain consent. The participant was then evaluated by an occupational therapist using the measurement battery and the 38-item I–HOPE over one to two visits (depending on the participant's tolerance). The evaluation was followed by a home modification intervention.

Although the results of this study are reported elsewhere (Stark & Ellert, 2004), for the purpose of understanding the instrument's clinical utility, we briefly describe the intervention. The occupational therapy intervention included the provision of adaptive equipment, architectural modifications, major home renovation, and substantial training by an occupational therapist. An average of four problems was addressed for each participant (range = 1–7). The most common modifications included grab bars, bath seats, hand-held showerheads, additional lighting, and reacher devices. Less frequently provided interventions included removing tubs and replacing them with walk-in showers and installing ramps at home entrances. An average of five occupational therapy treatment visits was provided.

Table 1. Demographic Characteristics

Characteristic	Phase 1 (n = 77)	Phase 2 (n = 10)
Mean age, yr (standard deviation)	81 (6.7)	74.4 (8.1)
Gender, *n* (%)		
Male	10 (13)	2 (20)
Female	67 (87)	8 (80)
Ethnicity, *n* (%)		
White	71 (92)	7 (70)
African-American	5 (7)	3 (30)
Asian	1 (1)	0
Marital status, *n* (%)		
Married	15 (19)	5 (50)
Divorced	11 (14)	2 (20)
Widowed	51 (66)	3 (30)
Education, *n* (%)		
Some high school	7 (9)	1 (1)
High school	23 (30)	2 (20)
Some college	27 (35)	4 (40)
College	20 (26)	3 (30)
Home type, *n* (%)		
Home	10 (13)	6 (60)
Condo/apartment	67 (87)	4 (40)

Three months after completion of the modifications, the same occupational therapist readministered the assessment battery, including the performance of daily activities, satisfaction with performance of daily activities, and environmental barrier severity subscales of the I–HOPE.

I–HOPE Revision

We made several revisions to the assessment on the basis of feedback from clinicians and preliminary descriptive analyses of the data. As part of the first step (the card sort), the occupational therapist asked each participant whether any unique activities were not depicted in the cards that were important to evaluate. Participants independently identified an additional three items ≥20 times: opening a jar, getting in and out of a car, and getting on and off a toilet. Participants identified another set of activities ≥3 times: using a computer, operating a faucet, and getting into and out of the shower. Those items were subsequently added to the list of activities. Six new cards were developed using the same procedure for developing the original activity cards.

During the rating step of the I–HOPE, the 10-point performance of daily activities and satisfaction with performance of daily activities subscales proved difficult for older adults to use. Clinicians reported difficulty eliciting valid responses using this metric. The scale was reduced to 5 points and piloted on a small group of participants. Clinicians reported that this scale appeared to be more clinically valid—a finding consistent with those of Carp (1989), who found that 5-point scales are most liked by older adults and have the best distributions of responses. Thus, we adopted the 5-point scale for the final version of the I–HOPE.

Clinicians also noted during the sort that several participants expressed concerns for safety and their ability to complete activities in the future, but no sort category met those criteria. For example, several participants admitted to slipping in the tub but felt that they were currently performing the activity without difficulty. A new category was added to the card sort with the title *worried about doing in the future* and was assigned a value of .75 for scoring purposes.

The revised I–HOPE included 44 items with five sorting categories and a 5-point Likert-type scale for rating satisfaction and performance. The revised measure was successfully piloted on a sample of 3 participants before including it in the final I–HOPE.

Phase 2

Interrater Reliability. Between September 2006 and May 2007, we recruited a convenience sample of 10 older adults using snowball sampling from a community service provider in St. Louis, Missouri. These participants were included if they identified one or more problems with ADLS, were age ≥60, and participated in the community program. Participants were excluded if they lived in congregate living facilities or had a cognitive impairment as indicated by a score of ≥10 on the Short Blessed Test (Katzman et al., 1983). None of the participants lived with each other (e.g., were spouses or siblings), so there were 10 unique environments for this study. Participants were given a $10 gift certificate to a grocery store for their participation.

Baseline characteristics are shown in Table 1. The group members were also predominately White and female, although this sample was younger than the Phase 1 participants.

Procedures. Interrater reliability was established by testing the 10 participants with the revised 44-item I–HOPE on one occasion with two trained raters blinded to one another's responses. The entire battery of assessments described in Phase 1 was repeated for this study. Before conducting the assessments, both clinicians attended a 4-hr training session that included an introduction to the measure, review of the assessment protocol, explanation of the scoring procedures, a demonstration, and time to practice conducting the assessment with a peer. Rater 1 had 6 yr experience in community-based home modification programs; Rater 2 had 3 yr experience.

The raters visited the home together, but one was randomly (by flip of a coin) assigned to conduct the assessment protocol while the other observed and scored the I–HOPE in silence. After the assessment process was complete, both raters had time to privately ask for additional information from the client. Raters did not discuss findings or scores with one another for the duration of the study. We used this approach, which is similar to that of Gitlin et al. (2002), to control for the variability that occurs in the living environment on a daily basis.

Data Analysis. Data were entered into Microsoft Access for Windows and checked for accuracy. All analyses were conducted using SPSS Version 15.1 (SPSS Inc., Chicago).

For the first phase, we examined the main effect of the intervention on daily activity performance, satisfaction, and environmental barriers using paired t tests with Bonferroni adjustments. We evaluated internal consistency of the items using Cronbach's α reliability coefficient. Scores on the subscales (performance of daily activities, satisfaction with performance of daily activities, and environmental barrier severity) were considered reliable if coefficients were >.7 (Nunnally & Bernstein, 1994). We calculated criterion validity of the I–HOPE performance of daily activities score to the FIM total

score by means of the Pearson correlation coefficient, using criteria for evaluating correlation coefficients from clinical data as described by Portney and Watkins (2008). We also examined the I–HOPE scores in comparison with relevant demographic characteristics.

To estimate the interrater reliability of the I–HOPE in the second phase, we analyzed agreement between raters using an intraclass correlation coefficient (ICC). Shrout and Fleiss's (1979) second model was used to calculate the ICC. This calculation assumes that all participants are assessed by the same raters, who are considered representative of the larger population of raters. Using Shrout and Fleiss's criteria, agreement was considered excellent when the ICC was ≥.75, whereas ICCs <.75 indicated moderate to poor reliability.

Results

For the group who received home modifications (Phase 1), functional disability, as measured by the FIM motor score, indicated mild to moderate disability with a mean score of 72.7 (range = 45–82). Older adults performed an average of 33 of the 38 activities from the initial-version card sort. Activity participation rates are presented in Table 2. The proportion on the performance of daily activities subscale (measured only during pretest) was 0.84 (standard deviation = 0.11, range = 0.48–0.99). The average time to conduct the I–HOPE portion of the assessment battery was 30 min. Participants reported that they enjoyed participating in the assessment, and there was no report of undue assessment burden.

We used paired *t* tests to examine the differences between pretest and posttest scores for both satisfaction and performance. Participants demonstrated an improvement in scores in both satisfaction and performance (Table 3). Mean pretest performance scores rose significantly from 5.70 points on the pretest to 7.38 on the posttest ($t[66] = -8.07$, $p = .000$). Scores on the satisfaction subscale significantly increased from pretest to posttest, with an initial mean score of 5.14 and a posttest mean of 7.27 ($t[66] = -10.27$, $p = .000$). The environmental barrier severity mean initial score was 10.88 but was reduced to 3.69 after the intervention ($t[66] = 13.45$, $p = .000$). A comparison of the initial (106.42) and posttest (112.52) total FIM scores indicated an improvement in function ($t[66] = -9.85$, $p = .000$).

The internal consistencies of the subscales were as follows: activity participation subscale, $\alpha = .85$ (38 items); satisfaction with performance of daily activities subscale, $\alpha = .78$ (6 items); performance of daily activities subscale, $\alpha = .77$ (6 items), and environmental barrier severity subscale, $\alpha = .77$ (8 items). All subscales demonstrated good internal consistency applying Nunnaly and Bernstein's (1978) criteria, which suggests that a finding of .7–.9 indicates good internal consistency.

We addressed convergent validity by examining the correlation between the I–HOPE and the FIM. We hypothesized that the I–HOPE performance of daily activities and satisfaction with performance of daily activities subscale scores would be positively correlated with the FIM and that the environmental barrier severity subscale would be negatively correlated. In addition, we hypothesized that activity scores would be correlated to older adults' age and number of chronic conditions. The FIM was positively correlated with the I–HOPE performance of daily activities subscale ($r[75] = .53$, $p < .000$) and satisfaction with performance of daily activities subscale ($r[75] = .43$, $p < .000$). The FIM was negatively correlated with the I–HOPE environmental barrier severity subscale ($r[75] = -.46$, $p < .000$), indicating that more barriers correlated with a poorer FIM score. These correlations were fair to moderate (Portney & Watkins, 2008). Correlations between activity scores and participant characteristics were examined. A composite score was created by summing the number of comorbid conditions that participants reported. A negative correlation ($r[75] = -.41$, $p < .000$) indicated that participants took part in fewer activities if they had more chronic conditions. No significant correlation was found between age and the I–HOPE activity participation subscale ($r[75] = -.02$, $p = .86$).

For Phase 2 ($n = 10$), the proportion of problem activities ranged from 0.61 to 1.0 with a mean of 0.92 (standard deviation = 0.13). The proportion on the activity participation subscale indicated that older adults performed an average of 41 of the 44 activities from the revised card sort. We calculated ICCs for the I–HOPE subscales, and scores ranged from 0.94 to 1.0 for raters (Table 4). The strength of agreement for the I–HOPE was excellent for all subscales (Portney & Watkins, 2008).

Discussion

Our goal was to provide a psychometrically sound instrument that (1) reliably ascertains older adults' participation in daily activities, (2) determines older adults' ability to perform the activities, (3) quantifies older adults' satisfaction with their performance, and (4) objectively quantifies degree or magnitude of environmental barriers' influence on activity performance. The assessment needed high clinical utility to address the issues faced by clinicians in treatment settings but needed to serve as a meaningful endpoint for clinical studies.

Table 2. Frequency of Activity Participation by Sort Category

Activity	Activities Want to Do		Activities Do Not Want to Do	
	Have Difficulty, Frequency (%)	*Cannot Do,* Frequency (%)	*No Problem,* Frequency (%)	*Do Not Want to Do,* Frequency (%)
Reaching for things up high	51 (68.9)	2 (2.7)	21 (28.4)	0
Taking a bath or shower	46 (62.2)	1 (1.4)	27 (63.5)	0
Getting up from chair or sofa	44 (59.5)	30 (40.5)	0	0
Going up or down stairs	40 (54.1)	6 (8.1)	24 (32.4)	4 (5.4)
Picking something up off floor	39 (52.7)	2 (2.7)	32 (43.2)	1 (1.4)
Carrying items	34 (45.9)	1 (1.4)	33 (44.6)	6 (8.1)
Opening jars[a]	34 (45.9)	1 (1.4)	26 (3.5)	0
Sleeping	30 (40.5)	1 (1.4)	43 (58.1)	0
Reading	28 (37.8)	1 (1.4)	45 (60.8)	0
Cleaning living area	27 (36.5)	2 (2.7)	32 (43.2)	12 (17.6)
Getting dressed	27 (36.5)	0	47 (63.5)	0
Getting in or out of entrance doors	26 (35.1)	1 (1.4)	47 (63.5)	0
Getting in or out of the car[a]	25 (33.8)	0	33 (44.6)	0
Writing	24 (32.4)	1 (1.4)	48 (64.9)	1 (1.4)
Getting on or off toilet[a]	23 (31.1)	0	38 (51.4)	0
Getting in or out of bed	21 (28.4)	1 (1.4)	52 (70.3)	0
Talking on the phone	18 (24.3)	0	55 (74.3)	1 (1.4)
Opening or closing doors	16 (21.6)	1 (1.4)	56 (75.7)	1 (1.4)
Repairing clothing	17 (23.0)	7 (9.5)	35 (47.3)	15 (20.3)
Washing and drying clothes	17 (23.0)	4 (5.4)	37 (50.0)	16 (21.6)
Preparing a meal	13 (17.6)	2 (2.7)	54 (73.0)	5 (6.8)
Paying the bills	12 (16.2)	1 (1.4)	57 (77.0)	4 (5.4)
Moving around in the home	12 (16.2)	0	62 (83.8)	0
Getting the mail	11 (14.9)	1 (1.4)	55 (74.3)	7 (9.5)
Controlling the environment (air conditioning, light switch)	11 (14.9)	0	61 (82.4)	2 (2.7)
Ironing clothes	9 (12.2)	2 (2.7)	30 (40.5)	33 (44.6)
Taking out the trash	9 (12.2)	4 (5.4)	52 (70.3)	9 (12.2)
Responding to an emergency	9 (12.2)	2 (2.7)	63 (85.1)	0
Answering door or phone	8 (10.8)	0	68 (86.5)	1 (1.4)
Repairing household objects	7 (9.5)	9 (12.2)	34 (45.9)	24 (32.4)
Taking medication	6 (8.1)	0	66 (89.2)	2 (2.7)
Grooming	6 (8.1)	0	68 (91.9)	0
Watching television	4 (5.4)	0	69 (93.2)	0
Caring for pets	3 (4.1)	5 (6.8)	9 (12.2)	57 (77.0)
Listening to music or radio	3 (4.1)	4 (5.4)	62 (83.8)	5 (6.8)
Washing dishes	3 (4.1)	1 (1.4)	65 (87.8)	5 (6.8)
Visiting with family and friends	2 (2.7)	3 (4.1)	66 (89.2)	3 (4.1)
Eating	2 (2.7)	0	72 (97.3)	0
Caring for children	1 (1.4)	3 (4.1)	10 (13.5)	60 (81.1)
Resting	1 (1.4)	1 (1.4)	70 (94.6)	2 (2.7)
Maintaining yard	0	0	2 (2.7)	71 (95.9)

Note. $N = 77$.
[a]Items added to the battery during pilot ($n = 63$).

In this preliminary study, we found the I–HOPE to be a psychometrically sound assessment that can be used to determine the activity patterns of older adults in their home, performance of daily activities, satisfaction with that performance, and influence of environmental barriers. Specifically, we determined that the I–HOPE is internally stable and demonstrates convergent validity with meaningful clinical measures. The I–HOPE performance of daily activates, satisfaction with performance of daily activities, and environmental barrier severity subscales are significantly correlated with the current criterion measure of disability (the FIM). As expected, the activity participation subscale was significantly correlated with the number of chronic conditions that participants reported. The direction of the relationship is what would be expected: The more chronic conditions people had,

Table 3. Differences Within Group Before and After Test for I–HOPE and FIM Scales: Phase 1

Scale	Pretest *M* (*SD*)	Posttest *M* (*SD*)
I–HOPE subscales		
Activity Participation	0.84 (0.11)	—
Performance of Daily Activities	5.70 (1.80)	7.38 (1.60)
Satisfaction With Performance of Daily Activities	5.14 (2.10)	7.28 (1.70)
Environmental Barrier Severity	1.80 (0.66)	0.54 (0.63)
FIM total score	106.60 (8.70)	112.70 (8.30)

Note. $N = 67$. All repeated measures were significant at $p = .000$; no posttest was conducted on the Activity Participation subscale. I–HOPE = In-Home Occupational Performance Evaluation; *M* = mean; *SD* = standard deviation.

the more they experienced barriers in their home. The I–HOPE suggests that health (chronic conditions) is related to activity participation, but age is not. The refined I–HOPE proved to be reliable across trained raters.

The I–HOPE is clinically useful. It supports a client-centered approach to practice and can be administered by a trained clinician. Training sessions lasted 4 hr, and the clinicians involved in this study were considered experts in home modification. Although additional training may be required for clinicians unfamiliar with the process of providing home modifications, the 4-hr training was successful in establishing reliability in rating.

The I–HOPE is conducted in the participant's home, takes approximately 30 min to complete, and is appealing to older adults. To our knowledge, it is the only reliable and valid performance-based assessment of the home environment that provides scores on activity participation, activity performance, satisfaction with performance, and environmental barriers. The I–HOPE quantifies the extent to which environmental barriers influence the participant's function on a performance-based assessment, moving beyond currently available instruments used in practice. This approach can account for the tremendous variability that can occur across homes by focusing on person–environment fit.

The I–HOPE shows excellent potential for measuring change in performance, satisfaction, and environmental barrier scores. In the intervention study, the I–HOPE was sensitive enough to detect a change in performance after environmental barriers were reduced. The differences between pretest and posttest scores were statistically significant, suggesting that the I–HOPE is a useful endpoint for clinical interventions that focus on reducing environmental barriers.

Limitations

One potential limitation of the I–HOPE is the performance-based nature of the assessment process. The client must be evaluated in his or her current environment, in contrast to the Housing Enabler, which can be conducted without the client present. The Housing Enabler's approach is useful for comparing potential homes for a client who is returning to the community and searching for a new home or for a client who is unable to leave a health care facility to participate in a home evaluation. Although performance-based assessment in the home is preferred (Golant, 2003), it is not always possible. This question deserves further study to examine the outcomes and policy implications of this type of assessment. Another potential drawback of the I–HOPE is that the study sample was not population based, and selection bias may limit the generalizability of the results. Our sample was biased toward White women. Further psychometric work with other populations is warranted.

Table 4. Intraclass Correlation Coefficients (ICCs)

I–HOPE Subscales	ICC
Activity Participation	.99
Performance	.94
Satisfaction	1.00
Environmental Barriers	.99

Note. $N = 10$, Phase 2. I–HOPE = In-Home Occupational Performance Evaluation.

Nonetheless, new models of intervention rely on the ability to quantify performance and environmental barriers in the home (Gitlin et al., 2002). The four dimensions defined by the I–HOPE subscales contribute to the development of important profiles of performance and environment. Indeed, the I–HOPE has potential utility for clinicians who provide care focused on supporting older adults' ability to age in place.

Conclusion

The purpose of this study was to present the development of a new measure of older adults' environment fit and to report the instrument's preliminary psychometric properties. The performance-based I–HOPE presents promising psychometric properties and offers a clinically relevant evaluation procedure. The findings suggest that it is possible to reliably measure the constructs of activity, performance, satisfaction, and barriers in the home. These dimensions appear to be related to criterion measures of disability and are meaningful in light of the sample's demographic characteristics.

Evaluating the home environment and the performance of activities in the home environment are important aspects of clinical interventions designed to assist older adults' aging in place. New models of disability research and theoretical perspectives that focus on the role of the

environment as influencing performance require empirical testing. A lack of sound environmental measures has resulted in limited research on person–environment fit, particularly as related to housing needs. Although the I–HOPE holds promise as a measure to capture person–environment fit, it requires additional study in more diverse populations. ▲

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