DISABILITY IN OLDER WOMEN WITH HEART FAILURE

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Heart failure is a major cause of disability among older adults in the United States, costing approximately $28.8 billion in 2004. The majority of these costs can be attributed to HF-related activity limitations. This dissertation explored limitations in activities of daily living in community dwelling older women with HF in three studies. The first study explored the concordance of four activity assessment methods (self-report, proxy-report, clinical judgment, and performance observation in the clinic) with a criterion method (performance observation in the home) in a single sample (n = 55). Multitrait-multimethod matrix analyses revealed that the best concordance with the criterion was achieved with in-clinic performance observation, however, the concordance was marginal at best - fair for 3 activity domains (functional mobility, personal care, and cognitive instrumental activities) and poor for 1 (physical instrumental activities) domain. With the same sample, the second study examined the influence of the environment on activity performance, by performance testing the same activities in an occupational therapy clinic and in participants' homes. The environment influenced the performance of daily living activities in neutral, enabling, and disabling ways, depending on whether activity independence, safety, or adequacy was being measured and whether

measurement accounted for functioning at the global, domain, or individual activity level. The third study examined the trajectory of activity limitations and impairments in the same heart failure sample compared to a group of older women without disabling diseases (n = 57) over 6 months. At baseline and follow-up, the non-disabled group performed more independently and adequately than the heart failure group but equally safely. Both groups experienced a loss of independence and adequacy over time but not of safety. Physical impairment and depression emerged as the most likely candidates responsible for the group differences and changes in functioning. Findings from these studies suggest that performance observation in the home may be the most valid method of assessing disability, the influence of the environment on performance is variable, and older women with heart failure sustain greater activity limitations than those without disabling diseases but the rate of change over time is similar.

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PREFACE

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1. INTRODUCTION

Heart failure (HF) is a major cause of morbidity, mortality, and disability among older adults in the United States (American Heart Association, 2004). Over 5 million Americans are diagnosed with HF with more than 550,000 new cases diagnosed each year in the United States alone (Rich, 1997). These numbers will increase as the number of persons older than 65 is expected to double over the next 40 years. HF currently represents the most costly medical illness with estimated direct and indirect costs in the United States for 2004 being 28.8 billion dollars (American Heart Association, 2004). The majority of these costs can be attributed to HF-related activity limitations.

Activity limitations are defined as difficulties an individual has in executing tasks or actions (World Health Organization, 2001). Two broad categories of activities in which limitations are usually measured are basic activities of daily living (BADL) and instrumental activities of daily living (IADL) (Spector, Katz, Murphy, Fulton, 1987). BADL are further subdivided into functional mobility (FM) and personal care (PC) activities. FM activities are actions that move the body across surfaces or transfer the body from one surface to another. These include activities such as bed transfers, toilet transfers, and indoor walking. Activities that are body-oriented and essential for self-care, such as dressing, trimming toenails, and oral care, are classified under PC. IADL consist of a more complex range of activities, and involve interactions with home and community environments and other individuals (Lawton & Brody,

1969). IADL include activities such as shopping, medication management, and meal preparation. These activities have been categorized into IADL with a cognitive emphasis (CIADL) and IADL with a physical emphasis (PIADL) (Rogers, Holm, Beach, Schulz, & Starz, 2001). Studies assessing activities in persons with HF have reported that their samples have substantial limitations in FM, PC, CIADL, and PIADL (Burns et al, 1997; Guccione et al., 1994; Incalzi, Corsonello, Pedone, Corica, Carbonin, & Bernabei, 2005; Kempen, Sanderman, Miedema, Meyboom-de Jong, & Ormel, 2000; Wolinsky, Smith, Stump, Overhage, & Lubitz, 1997).

In the model of disability of the International Classification of Functioning, Disability and Health (ICF), activity limitations are caused by impairments which in turn are caused by a health condition (World Health Organization, 2001). Impairments are dysfunctions in body functions (i.e., physiological or psychological) or body structures (e.g., organs, limbs or their components). Disease-associated impairments in cardiovascular structure and function in HF are caused as a result of conditions such as coronary artery disease, arrhythmias, and valvular heart disease. These impairments are evidenced in reduced endurance, marked by generalized fatigue and dyspnea. Because the typical patient with HF is older, the effects of disease–associated impairments are compounded by age-related impairments, such as the impaired ability of the heart to respond to physiologic stress and reduced cardiovascular reserve (Rich, 1997). Hence, it is often difficult to distinguish between activity limitations associated with HF and those related to normal aging. To clarify this distinction requires a comparison of the trajectory of activity limitations in persons with HF and those without disabling diseases.

Activity limitations can be measured by different data gathering methodologies such as self-report, proxy-report, clinical judgment, and performance-based observation. Self and proxy

reports predominant in research on activity limitations in older adults with HF. There are known differences in data gathered by these methods, such that persons may be disabled in an activity measured by one method but non-disabled when that same activity is measured by another method (Kempen, Sullivan, van Sonderen, & Ormel, 1999; Magaziner, Zimmerman, Gruber-Baldini, Hebel, & Fox, 1997; Myers, Holliday, Harvey, & Hutchison, 1993; Rogers et al., 2003; Wijlhuizen & Ooijendijk, 1999). Similarly, performance differences have been detected when observations of daily living activities are conducted in a hospital setting versus a home, with the clinic found to be both enabling and disabling depending on the study (Andrews & Stewart, 1979; Arenth & Mamon, 1985; Egan, Warren, Hessel, & Gilewich, 1992; Haworth & Hollings, 1979; Rogers et al., 2003; Sheikh, Smith, Meade, Goldenberg, Brennan, & Kinsella, 1979; West et al., 1997).

The overarching purpose of this dissertation was to explore activity limitations in older women with HF living in the community by examining the methods for measuring activity limitations and the trajectory of activity limitations associated with this chronic progressive disease. The specific aims were to:

1) explore the concordance of four functional assessment methods – self-report, proxy-report, clinical judgment based on impairment data, and performance-based observation in the clinic with performance-based observation in the home in older women with heart failure living in the community for four activity domains - functional mobility, personal care, instrumental activities of daily living with a cognitive emphasis and instrumental activities of daily living with a physical emphasis.

2) explore the influence of the environment on activity by examining the concordance between performance-based observation in the clinic and home for global functioning, 4 activity

domains (functional mobility, personal care, cognitive-instrumental activities of daily living, physical-instrumental activities of daily living), and the 26 specific activities included in these domains

3) examine the trajectory of global disability over 6 months in older women with HF, compared to the trajectory of a group of older women without disabling diseases (WELL) using data from performance-based observation in the home. A secondary aim of this study was to describe the changes in sensory, motor, cognitive, and affective functions over 6 months in older women with HF, compared to the WELL group.

Chapters 2, 3, and 4 present Aims 1, 2, and 3 respectively. In chapter 5, the results of the 3 studies are summarized.

2. CONCORDANCE OF METHODS FOR MEASURING ACTIVITY LIMITATIONS IN OLDER WOMEN WITH HEART FAILURE – A MULTITRAIT-MULTIMETHOD ANALYSIS

2.1. BACKGROUND

Self-report, proxy-report, clinical judgment, and performance-based observation in the clinic are methods of assessment used by clinicians and researchers to obtain information about clients' or participants' functional status in their homes. Subjective methods, such as self-report, proxy-report, and clinical judgment are perceptions of functional status collected through interviews or questionnaires or inferred from available health data (Zimmerman & Magaziner, 1994). In contrast, objective methods, such as performance-based observation in the clinic or home, involve direct observation of performance of specific activities by a skilled examiner, who evaluates activity performance using standardized criteria. Subjective methods are easier to learn to administer, less time consuming to administer, and financially more economical to administer than objective methods (Guralnik, Branch, Cummings, & Curb, 1989). Hence, subjective methods would be the methods of choice, if data obtained by subjective and objective methods were equally as indicative of in-home performance, where the routine activities of daily living naturally take place.

However, research suggests that there is low to moderate agreement between data obtained by self-report and performance-based observation in the home (Kempen, Sullivan, van

Sonderen, & Ormel, 1999; Myers, Holliday, Harvey, & Hutchison, 1993; Rogers et al., 2003; Wijlhuizen & Ooijendijk, 1999) and fair to moderate agreement between proxy-report and performance-based observation in the home (Magaziner, Zimmerman, Gruber-Baldini, Hebel, & Fox, 1997; Rogers et al., 2003). Clinical judgment has also been found to be significantly less concordant than self-report and proxy-report with performance-based observation in the home (Rogers et al., 2003). Even studies examining the concordance between performance-based observation in the clinic and home have yielded conflicting results with some researchers concluding that the prosthetic environment in the clinic enabled activity independence (Andrews & Stewart, 1979; Arenth & Mamon, 1985; Egan, Warren, Hessel, & Gilewich, 1992; Haworth & Hollings, 1979; Sheikh, Smith, Meade, Goldenberg, Brennan, & Kinsella, 1979) while other studies found the opposite (Rogers et al., 2003; West et al., 1997).

The available methodologic research on functional status has several significant limitations. First, most studies examining the concordance between functional status assessment methods have focused on the simultaneous examination of two subjective methods (Rubenstein, Schairer, Wieland, & Kane, 1984; Weinberger et al., 1992), two objective methods (Arenth & Mamon, 1985; Egan et al, 1992; West et al., 1997), or a subjective and objective method (Daltroy, Larson, Eaton, Phillips, & Liang, 1999; Edwards, 1990; Kempen, Sullivan, van Sonderen, & Ormel, 1999). A few studies have simultaneously compared three methods (Dorevitch et al., 1992; Magaziner et al., 1997). These studies, while offering vital information about the concordance between two or three methods, do not allow us to compare the relative concordance between an array of different methods against a criterion – such as performance-based observation in the home.

Second, the focus of methodologic research has been on basic activities of daily living (BADL), such as bathing and dressing (Andrews & Stewart, 1979; Arenth & Mamon, 1985; Egan et al., 1992; Wijlhuizen & Ooijendijk, 1999). Although several studies have included a few complex activities that would be classified as instrumental activities of daily living (IADL) (Myers, Holliday, Harvey, & Hutchinson, 1993; Sheikh et al., 1979; West et al., 1997), few have comprehensively examined home management activities (Haworth & Hollings, 1979; Magaziner et al., 1997; Rogers et al., 2003). Examining concordance between assessment methods for IADL is essential for clinicians and researchers alike because performance of IADL is often the deciding factor between older adults continuing to live independently in the community versus moving to a supportive environment.

Third, methodologic research has typically focused on discrete physical impairments resulting from diseases or health conditions, such as stroke (Andrews & Stewart, 1979; Sheikh et al., 1979), hip fracture (Egan et al., 1992; Magaziner et al., 1997), knee osteoarthritis (Rogers et al., 2003), and visual impairments (West et al., 1997). In contrast, conditions such as heart failure and congestive obstructive pulmonary disease are typically characterized by 'systemic' endurance-related physical impairments including decreased aerobic capacity and increased fatigability. This type of impairment may have a more general effect on activity performance than discrete impairments.

This study fills these methodologic knowledge gaps by simultaneously comparing five functional assessment methods, emphasizing IADL, and considering a population with dysfunction secondary to endurance-related impairments. Specifically, the study evaluated the concordance of BADL and IADL data obtained through self-report, proxy-report, clinical judgment based on impairment data, and performance-based observation in the clinic and home

for older women with heart failure living in the community using a multitrait-multimethod matrix approach. Twenty-six BADL and IADL categorized in four domains – functional mobility, personal care, IADL with a cognitive emphasis, and IADL with a physical emphasis – were the multiple traits against which the methods were compared. Although the multitrait-multimethod matrix allows us to compare the five methods with each other, this study was delimited to evaluate performance-based observation in the home (the criterion method) against the four other methods (self-report, proxy-report, clinical judgment, and performance-based observation in the clinic). Performance-based observation in the home was selected as the criterion method because performance is measured objectively and the home is the setting where most home management activities are routinely carried out.

2.1.1. Hypotheses

We hypothesized that there would be:

i. Poor to fair concordance between self-report and performance-based observation in the home across domains.

ii. Poor to fair concordance between proxy-report and performance-based observation in the home across domains.

iii. Fair to good concordance between performance-based observation in the clinic and performance observation in the home across domains.

iv. We also hypothesized that data obtained from clinical judgment would have the least concordance with data obtained from performance-based observation in the home, across domains, compared to the other data-gathering methods.

2.2. METHODS

2.2.1. Design

In this one sample study, all participants were examined by each of five functional assessment methods. The self-report interview was conducted first, followed by administration of the Skill Attribute Battery, which is a compilation of standardized and clinical impairment measures. Data from the Skill Attribute Battery were forwarded to therapists to make clinical judgments about the participants' activity limitations. Proxy informants were interviewed after participants by telephone. Performance-based observation in the clinic was followed by performance-based observation in the home (criterion) (see Figure 2-1). Data were analyzed using a multitrait-multimethod matrix approach.

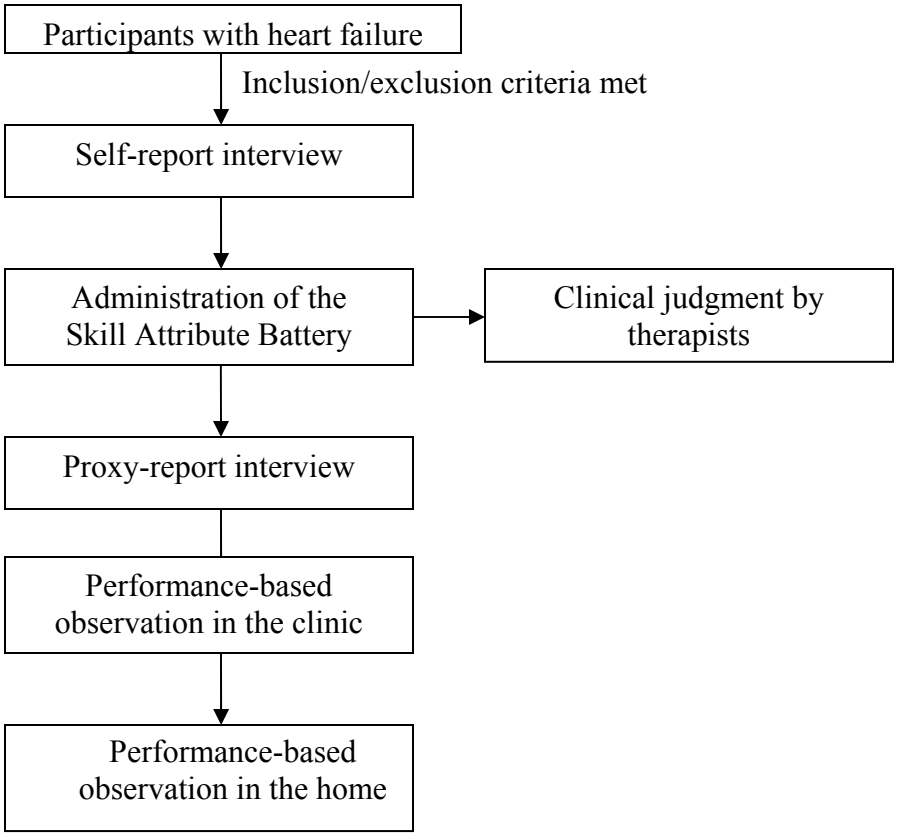

Figure 2-1: Flow Diagram of the Design of the Study.

2.2.2. Participants

Fifty-five older women with a primary diagnosis of heart failure (HF), living in the community in metropolitan Pittsburgh, Pennsylvania, participated in this study. To be included in the study, the participants had to: (1) be female; (2) be at least 70 years of age; (3) be living in the community; (4) be medically stable; (5) have a Mini-Mental State Examination Score (MMSE) ≥ 24 (Folstein, Folstein, & McHugh, 1975); (6) have a history of successful performance of activities of daily living on the OARS Multidimensional Functional Assessment BADL and IADL items (OARS) (Fillenbaum, 1988; Fillenbaum & Smyer, 1981); (7) report that their HF

interfered with at least one BADL or IADL on the OARS; and, (8) have no significant, uncorrected hearing or visual impairment. Participation was restricted to women, because for the current generation of older adults, the majority of IADL associated with independent living have traditionally been done by them (e.g., shopping, meal preparation, and sweeping). In addition, beyond 70 years of age, the incidence of HF in women surpasses that in men, and in a majority of these women (88%) leads to more activity limitations compared to men (Pinsky, Jette, Branch, Kannel, & Feinleib, 1990). A history of successful performance of IADL was required to rule out activity limitations attributable to a lack of learning or skill. In addition, each participant had to identify an adult proxy informant, who was familiar with her ability to care for herself and her home. The exclusion criterion was a secondary disabling diagnosis, such as dementia, major depression, macular degeneration, or, osteoarthritis.

2.2.3. Measures

Data regarding activity were collected through self-report by the participant (SR), proxy-report by an adult informant (PR), clinician's judgment of the participant's activity limitations based on impairment data (CJ), performance-based observation in the clinic (PBO-C), and performance-based observation in the home (PBO-H). Data regarding motor, sensory, cognitive and affective impairment were collected by the study assessors for the clinical judgment method and to describe the sample. Each assessment method was administered by a different assessor, who was blind to the results of the other methods. Demographic and health data were also collected.

2.2.3.1. Activity

We selected performance-based observation in the home as the criterion against which other methods would be compared, because the home is the familiar, lived-in environment where most routine activities of daily living related to personal care and home management occur. For each method we assessed the same 26 activities and rated the level of independent performance on an identical scale. All methods were anchored to the performance-based instrument, the Performance Assessment of Self-Care Skills (Rogers & Holm, 1989), hence, this method will be described first.

Performance-based observation: Clinic and home. Performance-based observations of activity performance in the clinic (PBO-C) and in the home (PBO-H) were rated on the Performance Assessment of Self-Care Skills (PASS) – clinic (PASS-C) and home (PASS-H) versions (Rogers & Holm, 1989). Activity demands on the two versions of the PASS are identical, but some activity materials are different because when tested at home, participants use their own materials. For example, for the medication management activity, participants use the medication containers and prescriptions provided by the examiner in the clinic, but use their own containers and prescriptions in the home.

The PASS consists of 26 activity items distributed in four domains: functional mobility (FM), personal care (PC), IADL with a cognitive emphasis (CIADL), and IADL with a physical emphasis (PIADL) (Holm & Rogers, 1999; Rogers et al., 2003; Rogers, Holm, Beach, Schulz, & Starz, 2001). The 5 FM items are: bed transfers, indoor walking, toilet transfers, tub and shower transfers, and stair use. The 3 PC items are: oral hygiene, trimming toenails, and dressing. The 14 CIADL are: shopping, paying bills by check, balancing a checkbook, mailing bills, using the telephone, managing medication, obtaining critical information from a radio (auditory), obtaining critical information from a newspaper (visual), repairing a flashlight, home safety

management, playing bingo, and preparing a light meal using an oven, the stovetop and sharp utensils. The 4 PIADL are: sweeping, disposing of garbage, changing bed linens, and cleaning up after meal preparation. To direct observation, each item is broken down into its component subactivities.

Activity independence, which is the ability to initiate, continue, and complete an activity without assistance from another person, is rated on a 4-point ordinal scale. The scale ranges from 0 to 3, with higher scores indicating increased independence. Independence ratings are based on the type and frequency of assistance or cues provided by the examiner and are applied to the subactivities comprising the activity. The independence score for each activity is the mean of the subactivities. Domain scores are the means of the independence scores of the activities comprising the domain.

Content validity of the PASS is referenced to common geriatric BADL/IADL instruments (Holm & Rogers, 1999), specifically, the OARS Multidimensional Functional Assessment Questionnaire – Activities of Daily Living (Pfeiffer, 1976), the Comprehensive Assessment and Referral Evaluation (Gurland, Kuriansky, Sharpe, Simon, Stiller, & Birkett, 1977), the rating scales for Physical Self-Maintenance and Instrumental Self-Maintenance (Lawton, Moss, Fulcomer, & Kleban, 1982), and the Functional Assessment Questionnaire (Pfeffer, 1987). See Appendix A (see Table 6-1 and Table 6-2) for detailed information regarding test-retest and inter-observer reliability for the clinic and home versions of the PASS.

Self-report and proxy-report. For each of the 26 activities, participants and their proxies were asked if they (participants) "could do" an activity; for example, "can you manage your medications?" Responses were scored on a 4-point ordinal scale ranging from 0 (could not

do) to 3 (could do). See Appendix B (see Table 6-3) for detailed information regarding test-retest reliability for the self-report and proxy-report interview questionnaires.

Clinical judgment. Clinical judgments by therapists were based on impairment data collected using the Skill Attribute Battery. The Skill Attribute Battery is a compilation of standardized or clinical assessments for measuring motor, sensory, cognitive, and affective impairments. Motor assessments were grip (Jamar dynamometer) and pinch strength (pinch meter) (Mathiowetz, Weber, Volland, & Kashman, 1984); the Jebsen Taylor Hand Function Test (Jebsen, Taylor, Trieschmann, Trotter, & Howard, 1969) for manual dexterity; the Keitel Functional Test (KFT) (Eberl, Fasching, Rahlfs, Schleyer, & Wolf, 1976) for active movement of the trunk and extremities; the Performance-Oriented Assessment of Balance (Tinetti, 1986) and Functional Reach for balance (Weiner, Duncan, Chandler, & Studenski, 1992); and tests for lung and ventilatory capacity from a portable dry spirometer – forced vital capacity (FVC), maximal ventilatory volume (MVV) and forced expiratory volume (FEV1). Sensory measures were visual acuity using a portable vision screener, and functional hearing using an adaptation of the Sent-Ident (Erber, 1992). The cognitive measures were the Modified Mini-Mental State (3MS) (Teng & Chui, 1987) and Trail Making – Parts A and B (Reitan, 1958). The affective measure was the Geriatric Depression Scale (GDS) (Sheikh & Yesavage, 1986). Clinical judgments about activity performance were inferred from these data by four occupational therapists, having a mean of 25 years of clinical experience. Inter-rater reliability was established at r = .92 (Rogers et al., 2003). See Appendix C (see Table 6-4) for detailed information regarding the impairment measures in the Skill Attribute Battery.

2.2.3.2. Demographics and Health Status

Demographic data, which were collected on a study devised form, were age, ethnic background, education, marital status, living arrangements, and household income. Health status, conceptualized as medical burden, was rated on the Cumulative Illness Rating Scale for Geriatrics (CIRS-G) (Miller & Towers, 1991; Miller et al., 1992). Each of the 14 items comprising the scale represents a human system (heart; vascular; hematopoietic; respiratory; eyes, ear, nose, throat, and larynx; upper gastrointestinal; lower gastrointestinal; liver; renal; genitourinary; musculoskeletal/integument; neurologic; endocrine/metabolic and breast; and psychiatric) and is rated on a 5-point ordinal scale ranging from 0 (no problem) to 4 (extremely severe problem). The scores from the 14 items are summed to calculate a total score. Scores range from 0 to 56, with higher scores indicative of greater medical burden.

2.2.4. Procedures

University of Pittsburgh Institutional Review Board approval was obtained prior to the start of this study. Potential participants were recruited from the outpatient service of the Benedum Geriatric Center at the University of Pittsburgh Medical Center. Patients potentially meeting study criteria were referred to the study, with the approval of their physicians. Study requirements were explained and informed consent was obtained from those willing to participate. A project geriatrician reviewed the medical records to confirm the diagnostic criteria. The OARS BADL and IADL items were administered verbally to ascertain if activity performance criteria were met. Assessments were scheduled within 5 days of eligibility criteria verification. Self-report interviews were conducted in-person on day 1 of study participation at the Benedum Geriatric Center, followed by the administration of the Skill Attribute Battery. Data from the Skill Attribute Battery was forwarded to the therapists for clinical judgments of

the participants' activity limitations. The proxy informant was interviewed by telephone within 2 days of the self-report interview. Performance-based observations were conducted in the clinic on the day after the self-report interview, followed by performance-based observations in the home on the next day. The order of the assessments was fixed to replicate clinical practice. Performance-based assessment in the clinic is often preceded by self and proxy-reports and followed by performance-based assessment at home. Furthermore, the risk of performance measurement influencing self-reports of function is greater than the reverse. The CIRS-G was completed either by the participant's personal physician or the project physician assistant.

2.2.5. Data Analyses

A multitrait-multimethod (MTMM) matrix (Campbell & Fiske, 1959) was used to examine the validity and concordance between the four data-gathering methods (SR, PR, CJ, and PBO–C) and the criterion (PBO–H). The FM, PC, CIADL, and PIADL domains were the traits that were measured by each of the five methods. Spearman rank correlation coefficients between the methods for different traits were computed with Bonferroni corrections. These intercorrelations of variables within and between methods were arranged to construct the MTMM matrix.

In the matrix, numbers in the reliability diagonal are estimates of the reliability of each data-gathering method (e.g. inter-observer reliability for the PBO-H). The convergent validity coefficients are correlations between the method of interest and the criterion for the same trait, (e.g., SR and PBO-H for FM domain, PR and PBO-H for the FM domain). The heterotrait-monomethod coefficients are correlations between traits that share the same method, (e.g., FM and PC domains for the SR method, CIADL and PIADL domains for the PBO-H method). Finally, the heterotrait-heteromethod coefficients are correlations between the method of interest

and the criterion for divergent traits (e.g., FM for SR and PC for PBO-H, PC for PR and PIADL for PBO-H) in the MTMM matrix. The heterotrait-monomethod and heterotrait-heteromethod coefficients are components of discriminant validity. We used the convergent and discriminant validity coefficients to interpret the correlation coefficients in the matrix.

To establish validity between two methods for a trait, the convergent validity coefficient should be significant. Also, all heterotrait-monomethod coefficients and heterotrait-heteromethod coefficients should be non-significant and substantially lower than the convergent validity coefficients. If convergent validity coefficients were significant, we examined the strength of the correlation coefficient to evaluate the concordance between methods of interest. If the convergent validity coefficients were not significant, they were regarded as evidence of poor concordance, regardless of strength. We modified the guidelines established by Portney and Watkins (2000, p.494) to measure the strength of correlations between pairs of measures to avoid overlap of values in each category. Correlations ranging from .00 to .25 indicate little or no relationship (poor); those from .26 to .50 suggest a fair degree of relationship; values of .51 to .75 are moderate; and values above .76 are considered good.

2.3. RESULTS

The 55 participants had a mean age ± standard deviation (SD) of 78.3 ± 5.3 years, and were primarily white, widowed, and lived alone. The majority had a trade/technical school education or less and had a household income of less than $50,000 (see Table 2-1). Medical burden was low with an endorsement of an average of 5.45 of 14 medical categories on the CIRS-G. Consistent with a HF diagnosis, moderate to severe problems were documented for 72.8% of the

participants in the heart category, 52.7% in the vascular category, and 43.7% in the respiratory category on the CIRS-G. Mild physical impairment was evidenced on the KFT, with participants requiring more than the criterion time for walking 30 meters (standard = 20 seconds) and ascending (standard = 7 seconds) and descending (standard = 7 seconds) 10 steps. Scores on the 3MS, Trail Making–Parts A and B, and the GDS suggested no cognitive or affective impairment. Descriptive data for performance-based observation in the home, self-report, proxy-report, clinical judgment, and performance-based observation in the clinic methods for each of the four domains are detailed in Table 2-2.

Proxies had a mean age ± standard deviation of 58.1 ± 15.8. A typical proxy was a daughter who did not live with the participant. The proxies reported that they spent at least 22.1 (SD ± 39.4) hours/week with the participant, and 50.9% usually provided some assistance.

Table 2-1: Demographic, Health Status, and Impairment Characteristics of Women with Heart Failure (n = 55)

Variable (score range)	
Demographics	
Age, mean ± SD, years	78.3 ± 5.3
Ethnic Background, %	
White	83.6
Black	16.4
Education, %	
Less than high school	21.9
High school graduate	58.2
College graduate	12.7
Graduate/professional training	7.3
Marital Status, %	
Single	9.1
Married	10.9
Widowed	72.7
Separated	1.8
Divorced	5.5
Living Arrangements, %	
Alone	80.0
With spouse	10.9
With children	9.1
Household Income, %	
$ 9,999 or less	37.5
$ 10,000 - $ 49,999	58.4
$ 50,000 or more	4.2
Health Status	
Cumulative Illness Rating Scale for Geriatrics, mean ± SD (0 – 56[a])	12.3 ± 3.9
Impairments, mean ± SD	
Keitel Functional Test (4 – 100[a])	21.4 ± 9.4
Keitel Functional Test – walk 30 meters - seconds[b]	28.0 ± 12.2
Keitel Functional Test – ascend 10 steps - seconds[c]	10.4 ± 10.9
Keitel Functional Test – descend 10 steps - seconds[c]	10.0 ± 10.0
Modified Mini-Mental State (0 – 100[d])	92.3 ± 5.0
Trail Making – Part A - seconds[a]	49.5 ± 17.5
Trail Making – Part B - seconds[a]	136.2 ± 66.1
Geriatric Depression Scale (0 – 15[a])	2.4 ± 3.9

Note. [a] Higher score indicates greater medical burden or impairment. [b] Standard time = 20 seconds. [c] Standard time = 7 seconds. [d] Lower score indicates greater impairment.

Table 2-2: Descriptive Data for Performance-Based Observation in the Home, Self-Report, Proxy-Report, Clinical Judgment, and Performance-Based Observation in the Clinic for the Four PASS Domains

Variable (score range)	*M*	*SD*	Minimum	Maximum
PBO-H (0 – 3[a])				
Functional mobility	2.8	0.3	2.0	3.0
Personal care	2.5	0.6	1.0	3.0
Cognitive IADL	2.9	0.1	2.4	3.0
Physical IADL	2.8	0.4	0.8	3.0
Self-report (0 – 3[a])				
Functional mobility	2.6	0.3	1.8	3.0
Personal care	2.7	0.4	1.7	3.0
Cognitive IADL	2.9	0.1	2.4	3.0
Physical IADL	2.5	0.4	1.3	3.0
Proxy-report (0 – 3[a])				
Functional mobility	2.7	0.3	0.6	3.0
Personal care	2.8	0.4	1.0	3.0
Cognitive IADL	2.9	0.1	1.2	3.0
Physical IADL	2.5	0.5	0.0	3.0
Clinical judgment (0 – 3[a])				
Functional mobility	2.5	0.5	0.6	3.0
Personal care	2.8	0.4	1.0	3.0
Cognitive IADL	2.5	0.5	1.2	3.0
Physical IADL	2.4	0.8	0.0	3.0
PBO-C (0 – 3[a])				
Functional mobility	2.9	0.2	2.1	3.0
Personal care	2.7	0.5	1.0	3.0
Cognitive IADL	2.8	0.1	2.3	3.0
Physical IADL	2.8	0.3	1.5	3.0

Note. PBO-H = Performance-based observation in the home. [a] Lower score indicates greater activity limitation. IADL = Instrumental activities of daily living. PBO-C = Performance-based observation in the clinic.

2.3.1. Multitrait-multimethod Matrix

The multitrait-multimethod matrix (MTMM) is presented in Table 2-3. The reliability diagonal is highlighted in blue, convergent validity coefficients are highlighted in pink; the heterotrait-monomethod coefficients in yellow, and the heterotrait-heteromethod coefficients in green.

2.3.1.1. Reliability Diagonal

In a MTMM matrix, the reliability diagonal is an estimate of reliabilities for each of the methods. Test-retest reliabilities in terms of percent agreement are reported for the SR and PR methods. For the other three methods – CJ, PBO-C, and PBO-H – inter-observer reliabilities are reported in terms of percent agreement. We reported percent agreement for the instruments used in the PBO-C and PBO-H methods because percent agreement is the clinically and statistically relevance choice with criterion-referenced instruments (PASS-C and PASS-H) (Cicchetti & Feinstein, 1990; Rogers et al., 2003; Rogers et al., 2001). Percent agreements were also reported for the other three methods to facilitate comparisons and maintain consistency between the methods.

2.3.1.2. Convergent Validity

In a MTMM matrix, convergent validity is established when two methods significantly correlate for the same domain. Our results indicate moderate convergent validity between PBO-H and SR for the FM domain. No convergent validity was established between the two methods for the PC, CIADL, and PIADL domains.

Similarly, results indicate moderate convergent validity between PBO-H and PR for the FM domain. No convergent validity was established between the two methods for the PC, CIADL, and PIADL domains.

Fair convergent validity was established between PBO-H and the CJ method for the FM domain. Similar to SR and PR, no convergent validity was established between PBO-H and CJ for the PC, CIADL, and PIADL domains.

In contrast, results indicated fair convergent validity between PBO-H and PBO-C for the FM, PC, and CIADL domains. However, our results indicated no convergent validity between the two methods for the PIADL domains.

2.3.1.3. Discriminant Validity

When evaluating discriminant validity, the heterotrait-monomethod coefficients should be lower than the convergent validity coefficients. However, these coefficients may be significant due to method variance. Method variance is the bias introduced in the measurement of traits, specifically based on the method of measurement (Campbell & Fiske, 1959). The heterotrait-heteromethod coefficients – correlations between different traits using different methods – should be non-significant.

Heterotrait-monomethod coefficients. Examination of the MTMM matrix revealed a method variance for the PBO-H, SR, PR, and CJ methods. For the PBO-H method, we found method variance between the FM and PC domains. As previously stated, method variance explains the significant correlation between the two domains for the same method.

A strong method variance for the SR method was indicated by significant correlations between the FM and PC; FM and PIADL, and PC and PIADL domains.

A strong methods variance was also evident for the PR method, where all correlations, except that between FM and PC were found to be significant.

Results similar to PR were also seen for the CJ method, where all correlations except that between FM and PC were found to be significant.

PBO-C was the only method where there were no significant correlations between the multitrait-monomethod coefficients indicating no methods variance.

Heterotrait-heteromethod coefficients. We focused on the criterion method when examining the heterotrait-heteromethod coefficients. For PBO-H and SR, we found significant correlations between the FM and PIADL domains. There were no significant correlations between the PBO-H and PR or the PBO-H and CJ methods. However, when comparing PBO-H and PBO-C, significant correlations were found between the FM and CIADL and the FM and PC domains.

Table 2-3: Multitrait-Multimethod Matrix of the Four PASS Domains for the Five Assessment Methods

		Self-report				Proxy-report				Clinical judgment				PBO-C				PBO – H			
		FM	PC	CIADL	PIADL	FM	PC	CIADL	PIADL	FM	PC	CIADL	PIADL	FM	PC	CIADL	PIADL	FM	PC	CIADL	PIADL
Self-Report	FM	*94*[a]																			
	PC	.56*	*93*[a]																		
	CIADL	.23	.21	*93*[a]																	
	PIADL	.59*	.52*	.17	*91*[a]																
Proxy-report	FM	.58*	.11	-.06	.44*	*97*[a]															
	PC	.32	.29	-.04	.30	.35	*93*[a]														
	CIADL	.33	.24	.20	.40*	.50*	.60*	*86*[a]													
	PIADL	.30	.27	-.06	.48*	.56*	.56*	.49*	*85*[a]												
Clinical judgment	FM	42*.	.37	.15	.45*	.31	.21	.46*	.22	*87*[b]											
	PC	.37	.29	.04	.33	.38	.40*	.41*	.43*	.34	*91*[b]										
	CIADL	.24	.39*	.10	.19	.15	.26	.41*	.22	.52*	.34*	*93*[b]									
	PIADL	.27	.23	.12	.42*	.35	.27	.59*	.32	.67*	.49*	.61*	*86*[b]								
PBO-C	FM	.41*	.23	.07	.23	.33	.32	.34	.28	.24	.26	.31	.29	*97*[a]							
	PC	.04	.10	-.07	.03	.01	.25	.24	-.02	.06	.08	.23	.02	.12	*91*[a]						
	CIADL	.22	.20	.02	.10	.15	.04	.18	.01	.26	.08	.48*	.29	.12	.13	*93*[a]					
	PIADL	.21	.34	.28	.19	.00	.25	.32	.05	.25	.22	.35	.26	.08	.27	.21	*94*[a]				
PBO-H	FM	.56*	.32	.07	.40*	.52*	.28	.33	.28	.39*	.15	.27	.30	.42*	.25	.40*	.31	*99*[a]			
	PC	.33	.35	.21	.27	.16	.30	.34	.14	.36	.38	.38	.26	.42*	.44*	.05	.21	.45*	*98*[a]		
	CIADL	.05	-.02	-.06	-.02	.09	.06	-.00	.15	.24	-.06	.25	-.04	.11	.03	.40*	-.22	.26	.18	*94*[a]	
	PIADL	.17	.20	-.00	.33	.35	.11	.28	.36	.30	.04	.16	.24	.25	-.08	.04	-.04	.34	.32	.36	*97*[a]

Note. Blue = Reliability diagonal. Pink = Convergent validity correlation coefficients. Yellow = Heterotrait-monomethod correlation coefficients. Green = Heterotrait-heteromethod correlation coefficients. PBO-H = Performance-based observation in the home; PBO-C = Performance-based observation in the clinic. FM = Functional mobility; PC = Personal care; CIADL = Instrumental activities of daily living with a cognitive emphasis; PIADL = Instrumental activities of daily living with a physical emphasis. [a] Percent agreement (test-retest reliability). [b] Percent agreement (inter-observer reliability).

*Bonferroni corrections $p < .003$.

2.4. DISCUSSION

The main purpose of this study was to simultaneously compare four functional assessment methods – SR, PR, CJ, and PBO-C to a criterion method – PBO-H – among older women with HF living in the community. Overall, our findings reveal fair to moderate concordance between the criterion and the four functional assessment methods depending on the domain considered. We hypothesized that there would be poor to fair concordance between PBO-H and SR and PR. Our results supported these hypotheses for the PC, CIADL and PIADL domains, if we use strength of the correlations as our criterion. However, if we use the significance of the correlation as our criterion, as recommended by Campbell and Fiske (1959), these hypotheses were not supported because concordance was so low that the correlations were not significant. The SR and PR methods were moderately correlated with the criterion for the FM domain. In contrast, the concordance of PBO-C with the criterion method was fair and our hypothesis that performance assessment in the clinic would fairly to moderately correlate with performance assessment in the home was partially supported for the three domains – FM, PC, and CIADL. Lastly, as hypothesized, CJ was found to be least concordant with the criterion compared to the other three assessment methods.

Our findings indicate that compared to the other methods, PBO-C may be the most valid surrogate method for reflecting persons' independent performance in their homes for the FM, PC, and CIADL domains. However, it should be noted that the strength of the correlation between the two methods was only fair for these domains. Comparisons between performance-based observation in the clinic and home have suggested poor to fair (Andrews & Stewart, 1979; Egan et al., 1992), moderate (Arenth & Mamon, 1985; Rogers et al., 2003; West et al., 1997) and

good (Dorevitch et al., 1985; Haworth & Hollings, 1979) concordance for activities in the FM domain. Similarly, poor (Egan et al., 1992; Rogers et al., 2003), fair (Andrews & Stewart, 1979), and good (Arenth & Mamon, 1985; Dorevitch et al., 1985; Haworth & Hollings, 1979) concordance between performance assessment in the clinic and home has been reported for activities in the PC domain. Our findings of fair concordance between performance in the clinic and home for the CIADL domain were in contrast to studies that reported poor (Rogers et al., 2003; Sheikh et al., 1979) and moderate to good (Haworth & Hollings, 1979; West et al., 1997) concordance between the two methods. The fair concordance between the clinic and home methods in our study may be attributed to environmental influences on activity performance (Haworth & Hollings, 1979; Sheikh et al., 1979; West et al., 1997). According to our study procedures, the same activities were performed in the clinic and home, using the materials and equipment inherent to each environment. Familiarity with the activity environment in the home may have positively influenced independence, while unfamiliarity with the activity environment in the clinic may have negatively influenced independence. Conversely, enabling clinic features, such as handrails on both sides of a stair case may have aided independence, while disabling home features, such as stair case without railings, may have hindered independence. Dissonances between the home and clinic like these could lead to real differences in activity performance versus assessment method per se.

Finally, our results suggested that PBO-C may not be a valid surrogate method for reflecting a person's performance of activities in the PIADL domain in their home. Our results agree with those reported by Rogers et al. (2003) and contrast with those reported by Haworth and Hollings (1979), who found moderate to good concordance. Activities classified in the PIADL domain are the most physically demanding, and hence the activities in which persons

with HF are most apt to experience limitations (Guccione et al., 1994; Incalzi, Corsonello, Pedone, Corica, Carbonin, Bernabei, 2005). According to Lawton's (1973) environmental docility hypothesis, as personal competence decreases, susceptibility to environmental factors increases. By performing physically-demanding activities, with reduced competence secondary to decreased endurance, our participants may have increased their sensitivity to environmental change, thus reducing methodologic concordance. Clinically, practitioners evaluating older women with HF need to be especially cognizant that inferences about activities like sweeping the floor, disposing of garbage, changing bed linens, and cleaning up after meals, based on clinic observations, should be made cautiously.

Although PBO-C may provide the most valid surrogate marker of in-home performance, and may be incorporated into epidemiologic studies (Finlayson, Havens, Holm, & Van Denend, 2003), SR and PR will continue to prevail in these studies because of their ease of administration and cost-effectiveness (Burns et al., 1997; Guccione et al., 1994; Pinsky et al., 1990). Nonetheless, because epidemiologic data guide healthcare policy formation, their validity has critical implications for disability benefits and management. However, our results indicate that self and proxy-reports may be valid substitutes for performance in the home only for the FM domain. The strength of these correlations was moderate. In addition, they were the strongest correlations obtained between any methods examined. FM activities, such as walking and sit to stand transfers, involve movement that is highly habitual and readily observable by others, thus facilitating both self and proxy ratings. For the other three domains – PC, CIADL, and PIADL – the correlations were not significant. This finding was particularly disappointing because we deliberately tried to maximize concordance by asking questions about the specific activities that participants would later be asked to demonstrate. Nonetheless, dissonance attributable to

methodology, could have arisen because our questioning strategy asked about independence in performing an activity, whereas our performance assessment strategy rated independence in completing the components of each activity. Potentially, concordance could be improved by drawing attention to activity components, thus raising awareness of any performance difficulties, when self-or proxy ratings of an activity are done. This interviewing strategy is coherent with the observation made by Fried et al. (1996) that questioning about changes in the frequency of performing activities or about modifications in the way in which activities were performed, were needed to elicit information about difficulties or dependencies. The moderate correlations between home performance and self and proxy reports obtained for FM agree with those previously obtained by Harris, Jette, Campion, and Cleary (1986), Magaziner et al.(1997), Rogers et al.(2003), and Wijlhuizen and Ooijendijk (1999), but the low correlations obtained for the three other domains contrast with the moderate to good correlations obtained in other studies (Harris, Jette, Campion, & Cleary, 1986; Kempen, Sullivan, van Sonderen, & Ormel, 1999; Magaziner et al., 1997).

As was the case for SR and PR, the CJ method was found to substitute validly for PBO-H method only for the FM domain. This method mimicked that used clinically when para-professionals, such as assistants or technicians, administer assessments, and forward these data to professionals for interpretation. The professional is challenged not only to synthesize data about impairments in motor, sensory, cognitive, and affect functions but to project the effects that these impairments have on the performance of everyday activities. The fair concordance between ratings obtained through CJ and PBO-H may have been supported by the correspondence, albeit in some cases overlap, between some of the FM activities and the physical impairment measures. For instance, the Keitel Functional Test items – ability to rise from a resting position, walk 30

meters, get on and off a chair, ascend stairs, and descend stairs – duplicate items of the Performance Assessment of Self-Care Skills. Thus, for 4 of 5 items in the FM domain, impairment and activity were comparable, precluding the need to infer functional status. Comparable results using the same impairment and disability measures were obtained by Rogers et al. (2003) in a sample of older women with knee osteoarthritis. For activities in the PC, CIADL, and PIADL domains, a direct relationship between impairment and activity was lacking, making inference necessary. Activity limitations in HF result from a combination of disease-related impairments, personal motivations, and environment factors. Evaluating a person's ability to perform daily activities from impairment data alone may lead to erroneous estimations of functioning.

The therapists and proxies had difficulty distinguishing between the four activity domains as evidenced by the poor discriminant validity of the clinical judgment and proxy-report methods. Participants themselves were slightly better at distinguishing between their independence in cognitively (CIADL) as opposed to more motorically (FM, PC, PIADL) oriented activities. The best ability to discriminate between performance in the activity domains was detected in the observational methods, with clinic observations more discerning than home observations. This is not surprising because the self-report, proxy-report and clinical judgment methods focus almost exclusively on activity performance outcomes, while observation highlights the activity process as well as its outcomes. Participants, for example, may not perceive instability associated with carrying a heavy bag of garbage, while this problem would be readily apparent to a trained observer.

Although the main purpose of our study was to evaluate the relative validity of self-report, proxy-report, clinical judgment and performance based observation in the clinic for

assessing in-home performance, the MTMM matrix also yielded additional significant validity correlations. Convergent validity was demonstrated for the FM domain, for self-report correlated with proxy report, clinical judgment and clinic observation; for the CIADL domain, for clinical judgment correlated with proxy report and clinic observation; and, for the PIADL domain, for self-report correlated with proxy report and clinical judgment. For the PC domain, convergent validity was evidenced only for proxy report and clinical judgment. With one exception, the strength of these correlations was fair, and hence no greater than those seen in relation to the criterion. The moderate correlation between self-report and proxy report for functional mobility was the exception, and it was comparable to that observed between these methods and the criterion. The strength of our correlations is typical of research on functional assessment methods (Kempen, et al., 1996; Little, Hemsley, & Volans, 1986; Long, Sudha, & Mutran, 1998; Magaziner, Simonsick, Kashner, & Hebel, 1988; Magaziner, Zimmerman, Gruber-Baldini, Hebel, & Fox, 1997; Rubenstein, Schairer, Wieland, & Kane, 1984; Sager, Dunham, Schwantes, Mecum, Halverson, & Harlowe, 1992; Santos-Eggimann, Zobel, & Berod, 1999).

This study had several limitations. First, we followed a fixed rather than a random order of assessment methods. Hence, data were first collected using self-report, followed by proxy-report, clinical judgments based on impairment data, performance-based observation in the clinic, and lastly observation in the home. While this fixed order may have introduced some bias in our data, for example, performance in the clinic influencing performance in the home due to a practice effect, we chose to follow the progression in the methods of data collection similar to the progressions in the healthcare setting. Furthermore, the risk of performance measurement influencing self-reports of function is greater than the risk of self-report influencing

performance, particularly when the methods are done on different days. Second, we identified performance based-observation in the home as the criterion against which the other methods were compared, because we felt that for community dwelling older women, the home was where most activities were routinely carried out in daily life. However, the superiority of performance-based observation compared to other methods of data collection, has been debated in the literature (Guralnik et. al, 1989; Myers et al., 1993). Third, at the time of participation in this study, the participants were medically stable and living in the community. Hence, our findings cannot be generalized to persons with heart failure who are not medically stable and may have been discharged from the hospital to a home or assisted living facility. Lastly, we chose to assess the influence of the environment on activities in older women with HF, because for this generation of older adults a majority of the IADL are performed by women. Hence, we are not able to make statements about the infleunce of the environment on activities for older men or other age groups with heart failure.

In conclusion, it is preferable to rely on data obtained through performance-based observation in the home to assess the level of a person's activity limitation. At best, self-reports, proxy-reports, clinical judgments by therapists, and performance-based observation in a clinic have only fair to moderate concordance with performance-based observation in the home for older women with HF. Hence, these methods may not provide an accurate estimate of ability or disability. Validity may be especially problematic for HF and other disease processes characterized by endurance impairments. This methodologic research warrants replication across a broader range of cardiopulmonary conditions and on people with more severe disability to assess the generalizability of the findings.

3. EFFECT OF THE ENVIRONMENT ON ACTIVITY PERFORMANCE IN OLDER WOMEN WITH HEART FAILURE

3.1. BACKGROUND

The influence of the environment in facilitating or hindering activity performance has been emphasized by disability models proposed by the Institute of Medicine (1997) and the World Health Organization (2001). Currently, disability is conceptualized as a function of person-environment interaction. The degree of disability experienced by a person depends not only on the integrity of body structures and functions but also on the extent of enabling support provided by the environment to compensate for disability. A person with heart failure, for example, who has severe shortness of breathe upon exertion, may be more limited in home management in a tri-level home compared to a ranch style home, because stair use leads to increased fatigue and reduced endurance.

In inpatient and outpatient healthcare settings, rehabilitation professionals often assess clients' ability to carry out activities of daily living in a clinic. In so doing, they assume that activity performance observed in the clinic imitates the performance that would be observed in the client's home. However, studies examining the agreement between performance of daily living activities in the clinic and home have yielded conflicting results. Some researchers found that the adaptive environment of the clinic supported activity independence to a greater extent

than the familiar environment of the home (Arenth & Mamon, 1985; Egan, Warren, Hessel, & Gilewich, 1992; Haworth & Hollings, 1979; Sheikh et al., 1979), while other studies found the opposite (Rogers et al., 2003; West et al., 1997). For rehabilitation professionals, identifying the activities that are most influenced by environmental factors and whether this influence is enabling or disabling has critical implications for discharge recommendations.

The present study examined the influence of the environment on activity performance in community dwelling older women with heart failure. Activity performance was tested in a standardized environment, in a hospital apartment, and in participants' homes. Previous studies assessed the environment-activity interaction in patient populations recovering from an acute episode (Arenth & Mamon, 1985; Andrews & Stewart, 1979; Dorevitch et al., 1992; Egan et al., 1992; Haworth & Hollings, 1979; Sheikh et al., 1979; Strub & Levine, 1987), such as stroke or rheumatoid arthritis. When these patients were discharged from the hospital to home, their functioning typically declined, suggesting that the home had a negative effect on their performance. However, influences attributed to the environment in these studies may be confounded by adjusting to newly acquired disability. By selecting a community dwelling sample with stable disability, we sought to avoid this confound. Previous studies also emphasized basic activities of daily living (BADL), that is the combination of functional mobility (FM) and personal care (PC) activities. Thus, there is a dearth of information about clinic-home performance differences for the more complex, instrumental activities of daily living (IADL). We examined two categories of IADL: cognitive-IADL, such as managing money and medications, and physical-IADL, such as changing bed linens and removing garbage. Our inclusion of the IADL is significant not only because these activities are likely to be more environmentally dependent than the BADL, because they necessitate more complex interactions

with activity materials and equipment, but also because they are early indicators of developing dependencies. Lastly, our study is unique in extending the consideration of activity performance beyond independence. When carrying out the routine activities of everyday life, older adults need to perform them without risk to themselves, others, or their home and complete them satisfactorily. Hence, we examined activity safety and adequacy in addition to independence.

3.1.1. Hypotheses

The specific hypotheses investigated were:

i. Overall, the environment will have a disabling influence on activity independence in the unfamiliar clinic environment compared to the familiar home environment. Activity independence is the ability to initiate, continue, and complete an activity without assistance from another person. However, bodily oriented activities, such as those in the functional mobility and personal care domains, will be performed equally independently in the clinic and the home. Activities that require more interaction with the surrounding environment and/or activity-equipment (environmentally-dependent) than is required by bodily oriented activities, such as activities in the cognitive-IADL and physical-IADL domains will be performed less independently in the clinic compared to the home.

ii. Overall, the environment will have an enabling influence on activity safety in the unfamiliar clinic environment compared to the familiar home environment. Activity safety is the ability to initiate, continue, and complete an activity without harm to oneself or the environment. Activities in the functional mobility, personal care, cognitive-IADL, and physical-IADL domains will be performed more safely in the clinic compared to the home,

as individuals are likely to be more vigilant in the unfamiliar clinic while performing activities to avoid risk or harm to themselves.

iii. Overall, the environment will have a disabling influence on activity adequacy measurement in the unfamiliar clinic environment compared to the familiar home environment. Activity adequacy is the ability to initiate, continue, and complete an activity in an efficient manner with no missing or extra steps. The end product must also be of acceptable quality. However, activities in the functional mobility and personal care domains will be performed equally adequately in the clinic and home. Activities in the cognitive-IADL and physical–IADL domains will be performed less adequately in the clinic compared to the home, because more trials or steps may be required to perform the activities in the unfamiliar clinic compared to the familiar home, making performance less efficient.

3.2. METHODS

3.2.1. Design

This was a one-sample study, with performance-based observation of functional status in the clinic followed by performance-based observation in the home (see Figure 3-1).

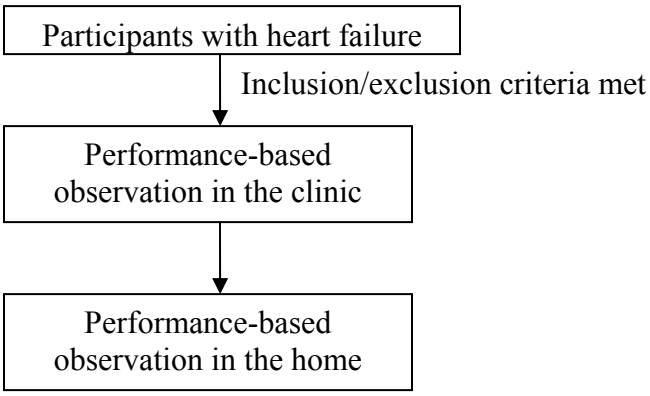

Figure 3-1: Flow Diagram of the Design of the Study

3.2.2. Participants

Fifty-five older women with a primary diagnosis of heart failure (HF), living in metropolitan Pittsburgh, Pennsylvania, participated in this study. To be included in the study, the participants had to: (1) be female; (2) be at least 70 years of age; (3) be living in the community; (4) be medically stable; (5) have a Mini-Mental State Examination Score (MMSE) $\geq$ 24 (Folstein, Folstein, & McHugh, 1975); (6) have a history of successful performance of activities of daily living on the OARS Multidimensional Functional Assessment BADL and IADL items (OARS) (Fillenbaum, 1988; Fillenbaum & Smyer, 1981); (7) report that their HF interfered with at least one BADL or IADL on the OARS; and, (8) have no significant, uncorrected hearing or visual impairments. Participation was restricted to women, because for the current generation of older adults, the majority of IADL associated with independent living have traditionally been done by women (e.g., shopping, meal preparation, and sweeping). In addition, beyond 70 years of age, the incidence of HF in women surpasses that in men, and in a majority (88%) of these women leads to more activity limitations compared to men (Pinsky et al., 1990). A history of successful

performance of IADL was required to rule out activity limitations attributable to a lack of learning or skill. The exclusion criterion was a secondary disabling diagnosis, such as dementia, major depression, macular degeneration, and, osteoarthritis.

3.2.3. Measures

The Performance Assessment of Self-Care Skills (PASS) – clinic and home versions were used as measures of activity. To describe the sample, demographic data were collected as well as measures of health status and of motor, cognitive, and affective impairments.

3.2.3.1. Activity

The Performance Assessment of Self-Care Skills (PASS) is a performance-based tool, consisting of 26 activities in 4 domains – functional mobility (FM), personal care (PC), IADL with a cognitive emphasis (CIADL), and IADL with a physical emphasis (PIADL) (Rogers & Holm, 1989). The 5 FM items are: bed transfers, indoor walking, toilet transfers, tub and shower transfers, and stair use. The 3 PC items are: oral hygiene, trimming toenails, and dressing. The 14 CIADL are: shopping, bill paying by check, checkbook balancing, bill mailing, telephone use, medication management, obtaining critical information from a radio (auditory), obtaining critical information from a newspaper (visual), flashlight repair, home safety management, playing bingo, and light meal preparation using an oven, the stovetop and sharp utensils. The 4 PIADL are: sweeping, disposing of garbage, changing bed linens, and cleaning up after meal preparation. Activity demands on the clinic and home versions of the PASS items are comparable, but some activity materials are different because when tested at home, participants use their own materials. For example, for the medication management activity, participants use

the medication containers and prescriptions provided by the examiner in the clinic, but use their own medication containers and prescriptions in the home.

Item scoring is based on an analysis of the critical subactivities needed to complete the activity. Bed transfers, for example, contains six subactivities. Each activity is rated for independence, safety, and adequacy on ordinal scales ranging from 0 – 3; higher scores indicate greater independence, safety, or adequacy. Independence scores are based on the type and frequency of assistance or cues provided by the examiner for each subactivity. The independence score for an activity is the mean of the subactivity scores. Safety takes into account risks to the client or the environment that occur while the activity is completed. The lowest safety observation for any subactivity becomes the safety score for that activity. Safety is rated for 17 of the 26 activities because the remaining 9 activities present no immediate risks to physical safety (e.g., reading a newspaper article). Activity adequacy considers the efficiency with which the activity is carried out and the quality of the product. The lowest adequacy observation for any subactivity becomes the adequacy score for that activity. Domain scores are the means of the independence, safety, or adequacy scores of the activities comprising the domain. PASS measurement parameter scores, that is the total scores, are the means for independence, safety, and adequacy scores for all activities and reflect global functioning.

Content validity of the PASS is referenced to common geriatric BADL/IADL instruments [Holm & Rogers, 1999; e.g., OARS Multidimensional Functional Assessment Questionnaire – Activities of Daily Living (Pfeiffer, 1976), the Comprehensive Assessment and Referral Evaluation (Gurland, Kuriansky, Sharpe, Simon, Stiller, & Birkett, 1977), the rating scales for Physical Self-Maintenance and Instrumental Self-Maintenance (Lawton, Moss, Fulcomer, & Kleban, 1982), and the Functional Assessment Questionnaire (Pfeffer, 1987)]. See Appendix A

(see Table 6-1 and Table 6-2) for detailed information regarding test-retest and inter-observer reliability for the clinic and home versions of the PASS.

3.2.3.2. Demographics and Health Status

Demographic data, which were collected on a study devised form, were age, ethnic background, education, marital status, living arrangements, and household income. Health status, conceptualized as medical burden, was rated on the Cumulative Illness Rating Scale for Geriatrics (CIRS-G) (Miller & Towers, 1991; Miller et al., 1992). Each of the 14 items comprising the scale represents a human system (heart; vascular; hematopoietic; respiratory; eyes, ear, nose, throat, and larynx; upper gastrointestinal; lower gastrointestinal; liver; renal; genitourinary; musculoskeletal/integument; neurologic; endocrine/metabolic and breast; and psychiatric) and is rated on a 5-point ordinal scale ranging from 0 (no problem) to 4 (extremely severe problem). The scores from the 14 items are summed to calculate a total score. Scores range from 0 to 56, with higher scores indicative of greater medical burden.

3.2.3.3. Impairment Measures

Motor impairment was measured with the Keitel Functional Test (KFT) (Eberl et al., 1976) which consists of 24 joint motions in the extremities and vertebral column as well as walking and stair use. Scoring is based on graded descriptions of movement. The scores from the 24 motions are summed to calculate a total score. Total scores range from 4 – 100, with higher scores indicating greater impairment. The Modified Mini-Mental State (3MS), a 15 item scale, was used to measure cognitive impairment (Teng & Chui, 1987). Total scores range from 0 to 100, with higher scores indicating better cognitive status. Trail Making – Parts A and B (Reitan, 1958) was also used as a test of cognitive status. It is a paper and pencil test which involves

drawing trails to connect letters (Part A) and numbers and letters (Part B). The time taken to complete each trail is recorded in seconds. The Geriatric Depression Scale (GDS) (Sheikh & Yesavage, 1986), 15 item version, was used to evaluate depressive symptoms. It is a self-report tool with the respondents answering "yes" or "no" to each question. Total scores range from 0 to 15, with higher scores indicating depressive symptomatology. See Appendix C (see Table 6-4) for detailed information regarding the impairment measures.

3.2.4. Procedures

University of Pittsburgh Institutional Review Board approval was obtained prior to the start of this study. Potential participants were recruited from the outpatient service at the Benedum Geriatric Center of the University of Pittsburgh Medical Center. Patients potentially meeting study criteria were referred to the study with the approval of their physicians. Study requirements were explained and informed consent was obtained from those willing to participate. A project geriatrician reviewed the medical records to confirm the diagnostic criteria. The OARS BADL and IADL items were administered verbally to ascertain if the activity criteria were met. Assessments were scheduled within 5 days of eligibility criteria verification. Impairment measures were administered on day 1 of study participation at the Benedum Geriatric Center. Participants returned to the Center on day 2 for performance based observation in the clinic. Performance-based observation in the home was carried out on day 3. Assessment in the clinic preceded assessment in the home, because in usual clinical practice, performance-based observation in the clinic often precedes performance-based observation in the home. The in-clinic and in-home assessments were done by different assessors. The CIRS-G was completed either by the participant's personal physician or the project physician assistant.

3.2.5. Data Analyses

3.2.5.1. PASS Total: Measurement Parameters

A 2 X 3 (Environment [clinic, home] X Measurement Parameters [independence, safety, adequacy]) factorial design ANOVA with repeated measures across both factors was conducted to compare performance in the clinic and home for each of the PASS measurement parameters (independence, safety, and adequacy). Because the analysis revealed a violation of Mauchly's sphericity assumption, adjustments were made to the ANOVA results, using the Greenhouse-Geisser epsilon (Field, 2002). Post-hoc analyses comparing each measurement parameter between environments were completed using paired samples *t*-tests with a Bonferroni adjustment.

3.2.5.2. PASS Domains

Separate two way repeated measures ANOVAs were conducted for independence, safety, and adequacy scores across the 4 PASS domains (FM, PC, CIADL, and PIADL) to compare performance in the clinic and home. Because the analyses revealed violations of Mauchly's sphericity assumption, adjustments were made to the ANOVA results, using the Greenhouse-Geisser epsilon (Field, 2002). Separate post-hoc analyses comparing independence, safety, and adequacy scores for each of the domains between environments were completed with paired samples *t*-tests with Bonferroni corrections.

3.2.5.3. PASS Activities

Paired samples *t*-tests were conducted with Bonferroni corrections to determine differences in activity independence, safety, and adequacy between the clinic and home environments for individual PASS activities.

3.3. RESULTS

The 55 participants had a mean age of 78.3 (standard deviation ± 5.3) years and were primarily white, widowed, and lived alone. The majority had a trade/technical school education or less and a household income of less than $50,000 (see Table 3-1). Medical burden was low with an endorsement of an average of 5.45 of 14 medical categories on the CIRS – G. Moderate to severe problems were documented for 72.8% of the participants in the heart category, 52.7% in the vascular category, and 43.7% in the respiratory category on the CIRS-G. Mild physical impairment was evidenced on the KFT, with participants requiring more than the criterion time for walking 30 meters (criterion = 20 seconds) and ascending (criterion = 7 seconds) and descending (criterion = 7 seconds) 10 steps. Scores on the 3MS, Trail Making–Parts A and B, and the GDS suggested no cognitive or affective impairment. Descriptive data for the PASS clinic and home versions for the total activity independence, safety, and adequacy measurement parameters is available in Table 3-2 and suggests that the enabling environment of the clinic may have a differential influence on routine tasks.

Table 3-1: Demographic, Health Status, and Impairment Characteristics of Women with Heart Failure (n= 55)

Variable (score range)	
Demographics	
Age, mean ± SD, years	78.3 ± 5.3
Ethnic Background, %	
White	83.6
Black	16.4
Education, %	
Less than high school	21.9
High school graduate	58.2
College graduate	12.7
Graduate/professional training	7.3
Marital Status, %	
Single	9.1
Married	10.9
Widowed	72.7
Separated	1.8
Divorced	5.5
Living Arrangements, %	
Alone	80.0
With spouse	10.9
With children	9.1
Household Income, %	
$ 9,999 or less	37.5
$ 10,000 - $ 49,999	58.4
$ 50,000 or more	4.2
Health Status	
Cumulative Illness Rating Scale for Geriatrics, mean ± SD (0 – 56[a])	12.3 ± 3.9
Impairments, mean ± SD	
Keitel Functional Test (4 – 100[a])	21.4 ± 9.4
Keitel Functional Test – walk 30 meters - seconds[b]	28.0 ± 12.2
Keitel Functional Test – ascend 10 step - seconds[c]	10.4 ± 10.9
Keitel Functional Test – descend 10 steps - seconds[c]	10.0 ± 10.0
Modified Mini-Mental State (0 – 100[d])	92.3 ± 5.0
Trail Making – Part A - seconds[a]	49.5 ± 17.5
Trail Making – Part B - seconds[a]	136.2 ± 66.1
Geriatric Depression Scale (0 – 15[a])	2.4 ± 3.9

Note. [a] Higher score indicates greater medical burden or impairment. [b] Standard time = 20 seconds. [c] Standard time = 7 seconds. [d] Lower score indicates greater impairment.

Table 3-2: Descriptive Data for Performance-Based Observation in the Clinic and Home for the PASS Total Measurement Parameters and Domains (N = 55)

Variable (Score range)	Clinic		Home	
	M	*SD*	*M*	*SD*
Measurement Parameters (0 - 3[a])				
Independence	2.81	0.12	2.64	0.16
Safety	2.84	0.10	2.94	0.07
Adequacy	2.38	0.23	2.56	0.27
Domains - Independence (0 - 3[a])				
Functional mobility	2.88	0.17	2.78	0.29
Personal care	2.70	0.48	2.46	0.61
Cognitive IADL	2.80	0.14	2.88	0.12
Physical IADL	2.81	0.32	2.80	0.39
Domains - Safety (0 - 3[a])				
Functional mobility	2.75	0.18	2.76	0.17
Personal care	2.95	0.17	2.95	0.17
Cognitive IADL	2.85	0.17	2.96	0.10
Physical IADL	2.86	0.17	2.99	0.06
Domains - Adequacy (0 - 3[a])				
Functional mobility	2.52	0.38	2.47	0.49
Personal care	2.31	0.55	2.19	0.67
Cognitive IADL	2.34	0.24	2.64	0.25
Physical IADL	2.41	0.44	2.65	0.45

Note. [a] Lower score indicates greater activity limitations.
IADL = Instrumental activities of daily living.

3.3.1. PASS Total: Measurement Parameters

A 2 X 3 (Environment X Measurement Parameters) ANOVA (see Table 3-3), with repeated measures on both factors, revealed significant main effects for environment, F (1, 54) = 24.97, p < .001, and measurement parameters, F (1.35, 72.84) = 278.62, p < .001. The environment X measurement parameter interaction term was also significant, F (1.64, 88.77) = 26.89, p < .001, indicating that safety and adequacy scores were lower in the clinic than in the home, while independence scores remained the same in both environments (see Figure 3-2).

Table 3-3: Analysis of Variance for PASS Total Measurement Parameters across Environments

Analysis/Source	*df*	*SS*	*MS*	*F*
Environment	1.00	0.66	0.66	24.97*
Error (within)	54.00	1.43	0.02	
Measurement Parameters	1.35	11.01	8.17	278.62*
Error (within)	72.84	2.16	0.03	
Environment X Measurement Parameters	1.64	0.49	0.30	26.89*
Error (within)	88.77	0.98	0.11	

Note. * $p < .05$

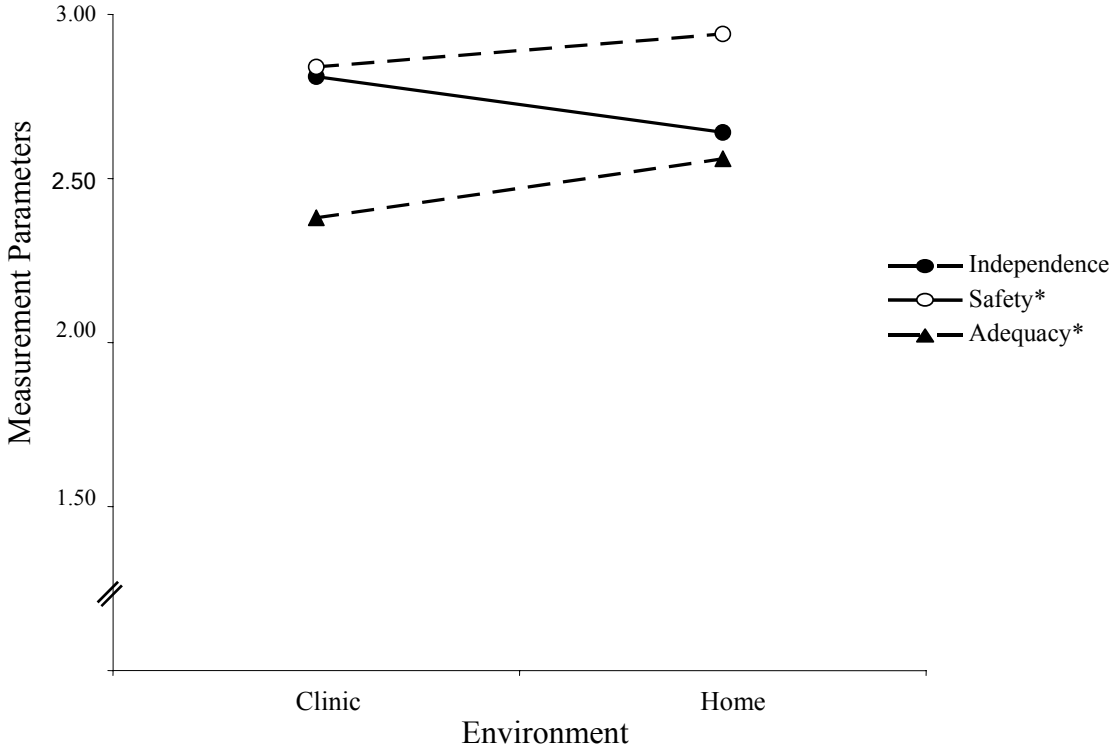

Figure 3-2: PASS Total Measurement Parameters for the Clinic and Home Environments

Note. * Broken lines indicate significant differences between activity performance in the clinic and the home

Paired samples *t* – test (with Bonferroni corrections; $p < .017$) revealed significant differences between environments for safety scores, $t(54) = -6.23$, $p < .001$, and adequacy scores, $t(54) = -5.40$, $p < .001$. No significant differences were seen between environments for independence scores, $t(54) = 0.62$, $p = .541$ (see Table 3-4).

Table 3-4: *t* – test Results for the Clinic and Home Environments for the PASS Total Measurement Parameters

Measurement Parameters	Clinic		Home		*t*	*p*
	M	*SD*	*M*	*SD*		
Independence	2.81	0.12	2.64	0.16	0.62	.541
Safety	2.84	0.10	2.94	0.07	-6.23	<.001*
Adequacy	2.38	0.23	2.56	0.27	-5.40	<.001*

Note: * $p < .017$ (with Bonferroni corrections).

3.3.2. PASS Domains-Independence

A 2 X 4 (Environment X Domains-Independence) ANOVA (see Table 3-5), with repeated measures on both factors, revealed significant main effects for environment, $F(1, 54) = 8.71$, $p = .005$, and independence scores for domains, $F(1.90, 102.87) = 11.33$, $p < .001$. The environment X independence scores for domains interaction term was also significant, $F(2.06, 111.16) = 7.43$, $p < .001$, indicating that independence scores for FM and PC were higher in the clinic than home; independence scores for CIADL were lower in the clinic than home; and, independence scores for PIADL were the same between environments (see Figure 3-3).

Table 3-5: Analysis of Variance for PASS Domains of Independence across Environments

Analysis/Source	*df*	*SS*	*MS*	*F*
Environment	1.00	0.58	0.58	8.71*
Error (within)	54.00	3.62	0.07	
Domains-Independence (D-I)	1.90	4.97	2.61	11.33*
Error (within)	102.87	23.70	0.23	
Environment X D-I	2.06	1.53	0.74	7.43*
Error (within)	111.16	11.13	0.10	

Note. * $p < .05$

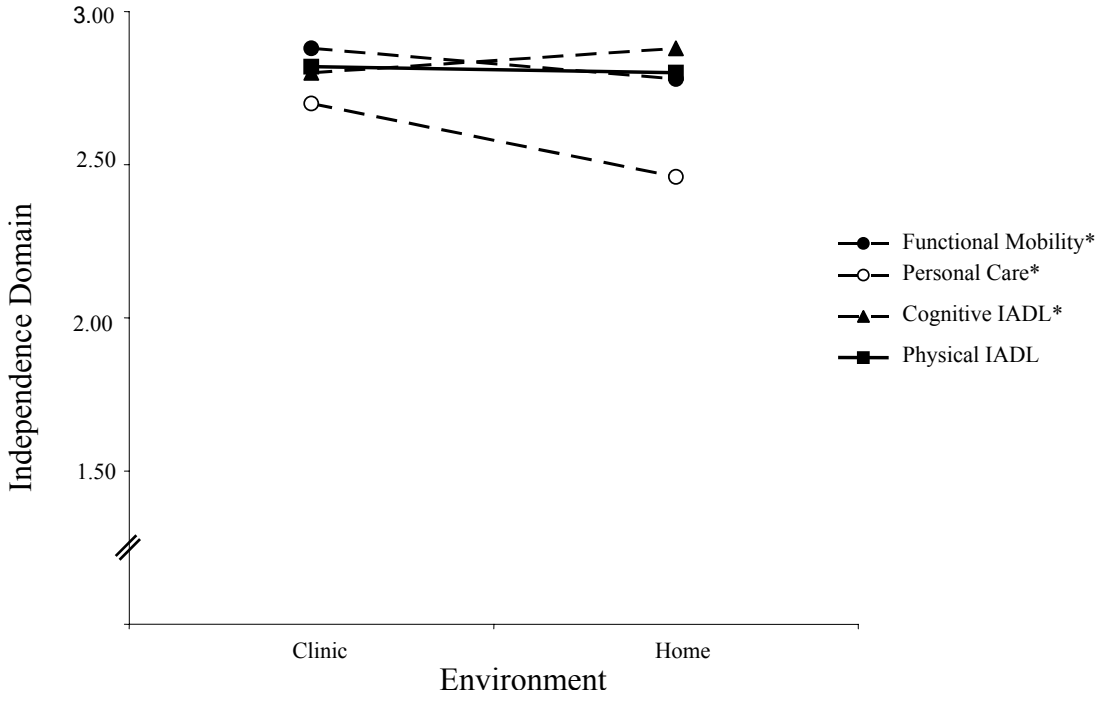

Figure 3-3: PASS Domains for Independence for Clinic and Home Environments

Note. * Broken lines indicate significant differences between activity performance in the clinic and the home

Paired samples *t* – test (with Bonferroni corrections; $p < .013$) revealed significant differences between environments for FM, $t(54) = 2.69$, $p = .009$, PC, $t(54) = 3.25$, $p = .002$, and CIADL independence scores, $t(54) = -3.73$, $p < .001$. No significant differences were seen between environments for PIADL independence scores, $t(54) = 0.12$, $p < .001$ (see Table 3-6).

Table 3-6: *t* – test Results for the Clinic and Home Environments for the PASS Domains for Independence

Domain - Independence	Clinic		Home		*t*	*p*
	M	*SD*	*M*	*SD*		
Functional Mobility	2.88	0.17	2.78	0.29	2.69	.009*
Personal Care	2.70	0.48	2.46	0.61	3.25	.002*
Cognitive IADL	2.80	0.14	2.88	0.12	-3.73	< .001*
Physical IADL	2.81	0.32	2.80	0.39	0.12	.646

Note: IADL = Instrumental activities of daily living.
* $p < .013$ (with Bonferroni corrections).

3.3.3. PASS Domains-Safety

A 2 X 4 (Environment X Domains-Safety) ANOVA (see Table 3-7), with repeated measures on both factors, revealed significant main effects for environment, $F(1, 54) = 35.55$, $p < .001$, and safety scores for the domains, $F(2.17, 117.09) = 23.60$, $p < .001$. The environment X safety scores for domains interaction term was also significant, $F(1.89,102.20) = 13.81$, $p < .001$, indicating that safety scores for CIADL and PIADL were lower in the clinic than the home and safety scores for FM and PC were the same between environments (see Figure 3-4).

Table 3-7: Analysis of Variance for PASS Domains of Safety across Environments

Analysis/Source	*df*	*SS*	*MS*	*F*	*p*
Environment	1	0.40	0.40	35.55	< .001*
Error (within)	54	0.61	0.01		
Domains-Safety (D-S)	2.17	2.57	1.19	23.60	< .001*
Error (within)	117.09	5.88	0.05		
Environment X D-S	1.89	0.38	0.20	13.81	< .001*
Error (within)	102.20	1.49	0.01		

Note. * $p < .05$

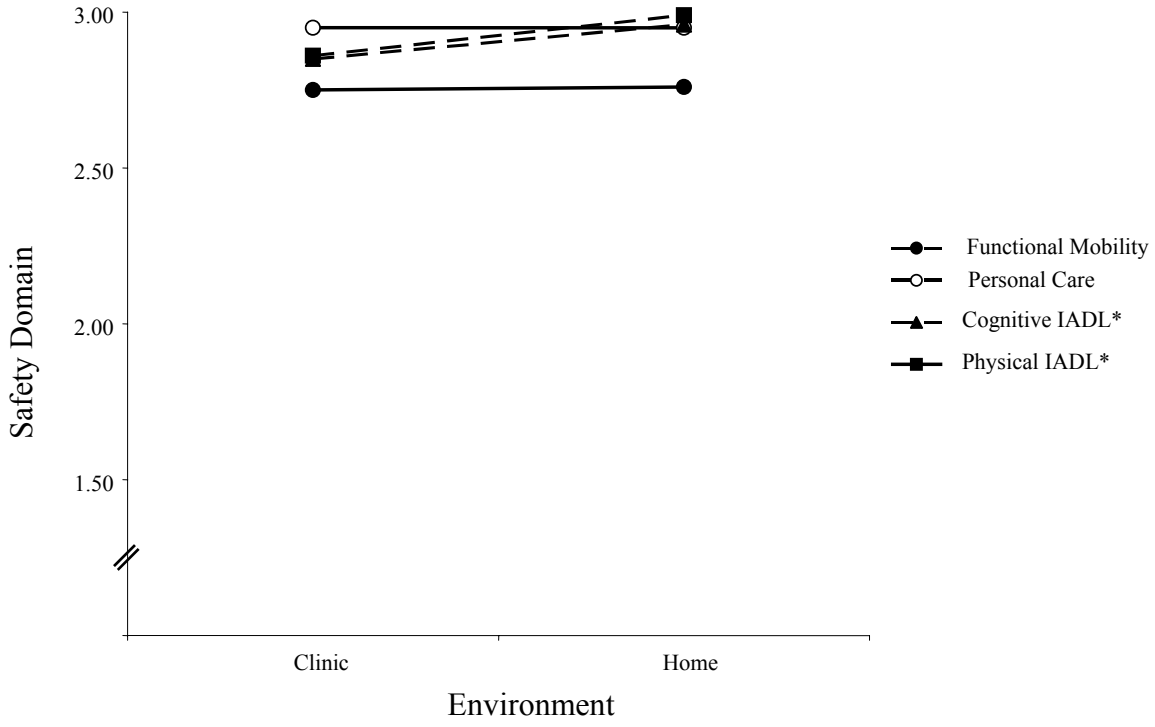

Figure 3-4: PASS Domains for Safety for Clinic and Home Environments

Note. * Broken lines indicate significant differences between activity performance in the clinic and the home

Paired samples t – test (with Bonferroni corrections; $p < .013$) revealed significant differences between environments for CIADL, $t(54) = -3.92$, $p < .001$, and PIADL safety scores, $t(54) = -5.11$, $p < .001$. No significant differences were seen between environments for FM, $t(54) = -1.00$, $p = .322$, and PC safety scores (see Table 3-8).

Table 3-8: t – test Results for the Clinic and Home Environments for the PASS Domains for Safety

Domain - Safety	Clinic		Home		t	p
	M	*SD*	*M*	*SD*		
Functional Mobility	2.75	0.18	2.76	0.17	-1.00	.322
Personal Care	2.95	0.17	2.95	0.17	-[a]	-[a]
Cognitive IADL	2.85	0.17	2.96	0.10	-3.92	< .001*
Physical IADL	2.86	0.17	2.99	0.06	-5.11	< .001*

Note: [a] = t cannot be computed because the standard error of the difference is 0.
IADL = Instrumental activities of daily living.
* $p < .013$ (with Bonferroni corrections).

3.3.4. PASS Domains-Adequacy

A 2 X 4 (Environment X Domains-Adequacy) ANOVA (see Table 3-9), with repeated measures on both factors, revealed significant main effects for environment, $F(1, 54) = 5.82$, $p = .019$, and for adequacy scores for the domains, $F(2.41, 129.93) = 9.46$, $p < .001$. The environment X adequacy scores for domains interaction term was also significant, $F(2.28, 122.93) = 11.43$, $p < .001$, indicating that adequacy scores for CIADL and PIADL were lower in clinic than in home, and adequacy scores for FM and PC were comparable (see Figure 3-5).

Table 3-9: Analysis of Variance for PASS Domains of Adequacy across Environments

Analysis/Source	*df*	*SS*	*MS*	*F*
Environment	1.00	1.00	1.00	5.82*
Error (within)	54.00	9.27	0.17	
Domains-Adequacy (D-A)	2.41	5.44	2.26	9.46*
Error (within)	129.93	31.05	0.24	
Environment X D-A	2.28	3.54	1.56	11.43*
Error (within)	122.93	16.74	0.14	

Note. * $p < .05$

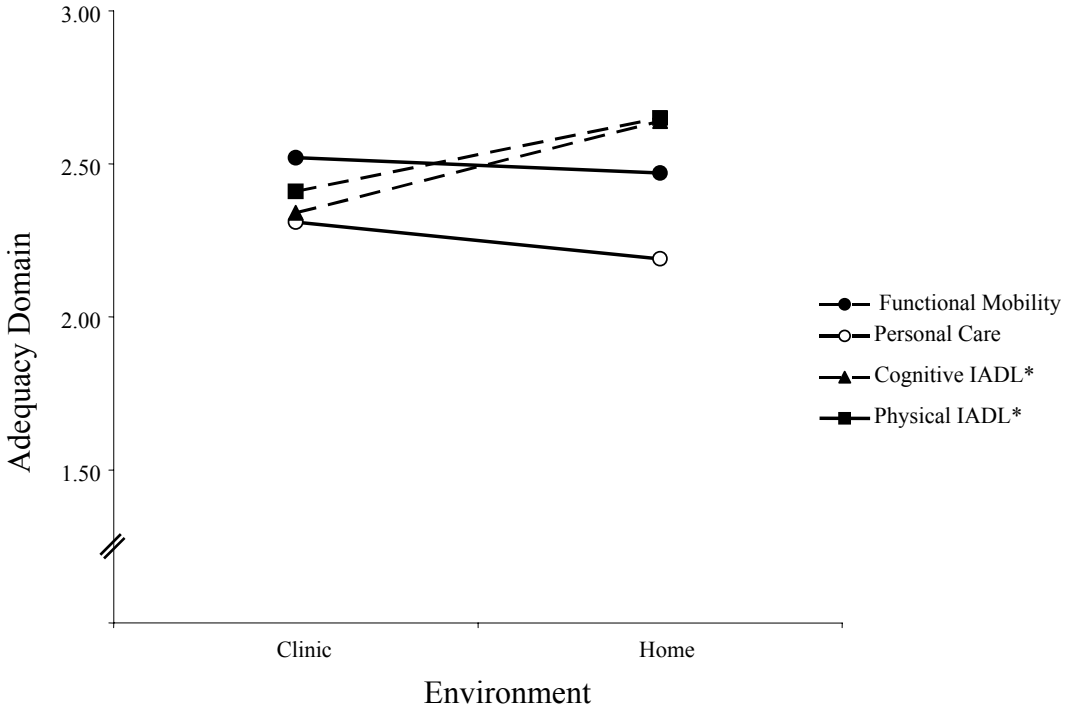

Figure 3-5: PASS Domains of Adequacy for Clinic and Home Environments.

Note. * Broken lines indicate significant differences between activity performance in the clinic and the home

Paired samples *t* – test (with Bonferroni corrections; $p < .013$) revealed significant differences between environments for CIADL, $t(54) = -8.20$, $p < .001$, and PIADL adequacy scores, $t(54) = -3.19$, $p = .002$. No significant differences were seen between environments for FM, $t(54) = 0.86$, $p = 0.393$ and PC adequacy scores, $t(54) = 1.33$, $p = .188$ (see Table 3-10).

Table 3-10: *t* – test Results for the Clinic and Home Environment for the PASS Domains for Adequacy

Domain - Adequacy	Clinic		Home		*t*	*p*
	M	*SD*	*M*	*SD*		
Functional Mobility	2.52	0.38	2.47	0.49	0.86	.393
Personal Care	2.31	0.55	2.19	0.67	1.33	.188
Cognitive IADL	2.34	0.24	2.64	0.25	-8.20	< .001*
Physical IADL	2.41	0.44	2.65	0.45	-3.19	.002*

Note: * $p < .013$ (with Bonferroni corrections). IADL = Instrumental activities of daily living.

3.3.5. PASS Activities

3.3.5.1. Independence

Paired samples *t* – tests for independence scores for individual items of the PASS in each domain revealed significant differences between the clinic and home for stair use (FM); trimming toenails (PC); telephone use, small repairs, and home safety (CIADL); and cleanup after meal preparation (PIADL) activities (see Table 3-11). Scores for stair use (FM) and trimming toenails (PC) were higher in clinic than in home, while scores for telephone use, small repairs, home safety (CIADL) and cleanup after meal preparation (PIADL) were lower in clinic than in home.

Table 3-11: *t*-test Results for the Clinic and Home Environments for Individual Activities on the PASS for the Independence Measurement Parameter

Activities (Score range)	Clinic		Home		*t*	*p*
	M	*SD*	*M*	*SD*		
Functional Mobility (0 – 3[a])						
Bed transfers	2.94	0.13	2.98	0.8	-2.27	.027
Indoor walking	2.98	0.08	3.00	0.00	-1.77	.083
Toilet transfers	2.95	0.10	2.98	0.07	-2.36	.022
Bathtub and shower transfers	2.62	0.59	2.46	0.69	1.51	.137
Stair use	2.92	0.43	2.43	1.18	3.05	.004*
Personal Care (0 – 3[a])						
Oral hygiene	2.72	0.80	2.71	0.87	0.10	.925
Trimming toenails	2.45	1.00	1.83	1.40	3.75	< .001**
Dressing	2.96	0.09	2.83	0.38	2.06	.044
Cognitive IADL (0 – 3[a])						
Shopping	2.61	0.33	2.63	0.36	-0.34	.738
Bill paying by check	2.84	0.40	2.90	0.13	-0.94	.351
Checkbook balancing	2.66	0.55	2.76	0.45	-1.20	.237
Mailing bills	2.76	0.41	2.90	0.16	-2.58	.013
Telephone use	2.88	0.15	2.99	0.04	-5.26	< .001[†]
Medication management	2.72	0.25	2.82	0.20	-2.83	.006
Obtaining critical information from a radio	2.82	0.32	2.95	0.15	-2.76	.008
Obtaining critical information from a newspaper	2.95	0.15	2.97	0.11	-0.81	.419
Small repairs	2.68	0.33	2.85	0.25	-3.65	.001[†]
Home safety	2.88	0.11	2.94	0.08	-3.36	.001[†]
Oven use	2.84	0.18	2.75	0.65	0.92	.362
Stovetop use	2.90	0.13	2.96	0.07	-2.96	.005
Use of sharp utensils	2.82	0.28	2.90	0.16	-1.96	.055
Playing bingo	2.83	0.45	2.95	0.28	-1.59	.118
Physical IADL (0 – 3[a])						
Cleanup after meal preparation	2.93	0.10	2.98	0.06	-3.20	.002[††]
Sweeping	2.79	0.60	2.93	0.41	-2.45	.018
Carrying the garbage	2.88	0.41	2.89	0.41	-0.17	.863
Changing bed linens	2.67	0.71	2.38	1.11	2.09	.042

Note. [a] Lower scores indicates greater activity limitation. IADL = Instrumental activities of daily living.

* $p < .01$ (with Bonferroni corrections). ** $p < .017$ (with Bonferroni corrections).

[†] $p < .004$ (with Bonferroni corrections). [††] $p < .013$ (with Bonferroni corrections).

3.3.5.2. Safety

Paired samples *t* – tests for safety scores for individual items of the PASS in each domain revealed significant differences between the clinic and home for stair use (FM), stovetop use (CIADL), and changing bed linens (PIADL) activities (see Table 3-12). Scores for each of these activities were lower in the clinic than in home.

Table 3-12: *t*-test Results for the Clinic and Home Environments for Individual Activities on the PASS for the Safety Measurement Parameter

Activities (score range)	Clinic		Home		*t*	*p*
	M	*SD*	*M*	*SD*		
Functional Mobility (0 – 3[a])						
Bed transfers	2.78	0.42	2.95	0.23	-2.43	.019
Indoor walking	2.98	0.14	3.00	0.00	-1.00	.322
Toilet transfers	2.96	0.19	2.96	0.19	0.00	1.000
Bathtub and shower transfers	2.58	0.50	2.51	0.54	-0.73	.470
Stair use	2.48	0.51	2.91	0.47	-3.77	< .001*
Personal Care (0 – 3[a])						
Oral hygiene	2.88	0.53	3.00	0.00	-1.63	.110
Trimming toenails	2.97	0.17	2.91	0.52	0.62	.535
Dressing	3.00	0.00	2.98	0.16	1.00	.322
Cognitive IADL (0 – 3[a])						
Medication management	3.00	0.00	2.98	0.14	1.00	.322
Small repairs	3.00	0.00	3.00	0.00	-[b]	-[b]
Oven use	2.78	0.52	2.91	0.36	-1.43	.160
Stovetop use	2.55	0.57	2.92	0.27	-4.18	< .001**
Use of sharp utensils	2.93	0.26	2.98	0.14	-1.35	.182
Physical IADL (0 – 3[a])						
Cleanup after meal preparation	2.95	0.23	3.00	0.00	-1.77	.083
Sweeping	3.00	0.00	3.00	0.00	-[b]	-[b]
Carrying the garbage	2.92	0.27	3.00	0.00	-2.06	.044
Changing bed linens	2.57	0.50	2.93	0.25	-4.11	< .001[†]

Note: [a] Lower scores indicates greater activity limitation. [b] = *t* cannot be computed because the standard error of the difference is 0. IADL = Instrumental activities of daily living.
* $p < .01$ (with Bonferroni corrections). ** $p < .01$ (with Bonferroni corrections).
[†] $p < .013$(with Bonferroni corrections).

3.3.5.3. Adequacy

Paired samples *t* – tests for adequacy scores for individual items of the PASS in each domain revealed significant differences between the clinic and home for oral hygiene and trimming

toenails (PC); checkbook balancing, mailing bills, telephone use, small repairs, stovetop use, and use of sharp utensils (CIADL); and cleanup after meal preparation and sweeping (PIADL) activities (see Table 3-13). Scores for trimming toenails were higher in clinic than the home, while scores for each of the other activities were lower in clinic than the home.

Table 3-13: *t*-test Results for the Clinic and Home Environments for Individual Activities on the PASS for the Adequacy Measurement Parameter

Activities (score range)	Clinic		Home		*t*	*p*
	M	*SD*	*M*	*SD*		
Functional Mobility (0 – 3[a])						
Bed transfers	2.49	0.57	2.58	0.60	-1.04	.301
Indoor walking	2.85	0.45	2.80	0.45	-0.62	.537
Toilet transfers	2.71	0.46	2.85	0.36	-2.21	.031
Bathtub and shower transfers	2.07	0.80	1.96	0.87	0.88	.381
Stair use	2.45	0.67	2.13	1.14	2.39	.020
Personal Care (0 – 3[a])						
Oral hygiene	2.36	0.85	2.67	0.90	-2.49	.016*
Trimming toenails	2.02	1.04	1.50	1.34	3.33	.002*
Dressing	2.55	0.54	2.38	0.71	1.32	.192
Cognitive IADL (0 – 3[a])						
Shopping	1.98	0.53	2.25	0.55	-2.76	.008
Bill paying by check	2.36	0.59	2.45	0.54	-0.82	.416
Checkbook balancing	2.11	0.57	2.44	0.69	-3.36	.001**
Mailing bills	2.09	0.48	2.69	0.47	-7.88	< .001**
Telephone use	2.29	0.57	2.84	0.37	-6.11	< .001**
Medication management	2.11	0.63	2.33	0.58	-2.06	.044
Obtaining critical information from a radio	2.65	0.55	2.91	0.29	-2.93	.005
Obtaining critical information from a newspaper	2.85	0.36	2.93	0.26	-1.43	.159
Small repairs	2.31	0.51	2.62	0.56	-3.32	.002**
Home safety	2.40	0.53	2.62	0.49	-2.70	.009
Oven use	2.23	0.52	2.51	0.75	-2.05	.046
Stovetop use	2.32	0.58	2.77	0.42	-4.56	< .001**
Use of sharp utensils	2.36	0.59	2.71	0.46	-3.81	< .001**
Playing bingo	2.64	0.83	2.89	0.57	-1.82	.075
Physical IADL (0 – 3[a])						
Cleanup after meal preparation	2.47	0.50	2.93	0.26	-5.59	< .001[†]
Sweeping	2.56	0.71	2.91	0.44	-4.39	< .001[†]
Carrying the garbage	2.47	0.60	2.65	0.67	-1.46	.151
Changing bed linens	2.13	0.80	2.11	1.15	0.11	.915

Note. [a] Lower scores indicates greater activity limitation. IADL = Instrumental activities of daily living.

* $p < .017$ (with Bonferroni corrections). ** $p < .004$ (with Bonferroni corrections).

[†] $p < .013$ (with Bonferroni corrections).

3.4. DISCUSSION

This study examined the influence of the environment on activity performance in community dwelling older women with heart failure. We investigated three measurement parameters (independence, safety, adequacy) in two environments (clinic and home), at three levels of analysis – global performance taking into account the total score for the 26 activities, domain performance taking into account the scores for the activities comprising each of the 4 activity domains, and performance in 26 specific activities. Typically, data collected for policy formation and in epidemiologic and clinical studies summarizes activity performance in total or domain scores. Nonetheless, rehabilitation practitioners do not treat global or domain functioning but rather intervene for individual activities, such as walking, dressing, and meal preparation. Thus, it is important to understand the effects of the environment on functioning at three levels – global, domain, and activity.

As hypothesized, our findings revealed that environmental influences may be enabling or disabling depending on the measurement parameter or the level of analysis being considered, however, the effects of these influences were not always as hypothesized. At the global level, activity independence in the clinic was equivalent to that in the home. At the domain level, functional mobility and personal care activities were more independent in the clinic than the home, while cognitive-IADL were less independent in the clinic, and physical-IADL were equally independent in both environments. At the activity level, using the stairs and trimming toenails were facilitated in the clinic, while telephoning, repairing a flashlight, determining home safety, and cleaning up after meals were hindered. We hypothesized that activity independence would be adversely affected when activities were performed in the clinic because it is an

unfamiliar environment and challenged participants to become acquainted with activity materials and equipment that were different from those they were accustomed to at home (Haworth & Hollings, 1979; Sheikh et al., 1979; West et al., 1997). This hypothesis was not supported at the global level, was supported at the domain level only for cognitive-IADL, and was supported for 4 activities. We hypothesized that activity performance would be safer in the clinic than in the home, because attention to an activity is typically increased when working in unfamiliar settings (Shumway-Cook & Woollacott, 2001). This hypothesis was not supported at the global, domain, or activity levels. Rather, activity safety was either equivalent in both environments or worse in the clinic than in the home. Lastly, our hypothesis that activity adequacy would be less in the clinic than in the home was supported at the global level and at the domain level for cognitive-IADL and physical-IADL – this was driven by 8 activities: telephoning, making small repairs, balancing a checkbook, paying bills, using the stove, using sharp utensils, cleaning up after a meal, and sweeping. Our hypothesis that adequacy would be equivalent in the clinic and home for the functional mobility and personal care domains was supported.

When environmental effects were exhibited, they were more likely to be disabling than enabling, with performance better in the home than in the clinic. Demonstration of greater skill in the home than in the clinic conflicts with the trend apparent in prior research but this incongruence is readily understandable from the population sampled. Unlike prior research (Arenth & Mamon, 1985; Andrews & Stewart, 1979; Dorevitch et al., 1992; Egan et al., 1992; Haworth & Hollings, 1979; Sheikh et al., 1979; Strub & Levine, 1987), which involved clinical samples that were transitioning from medical to community settings following an acute episode or medical rehabilitation, our participants were living successfully in the community with established HF-related disability. Our sample more closely resembled aging individuals who

voluntarily relocate to another geographical location or to downsize living space or in anticipation of needed instrumental assistance. Our findings suggest that familiarity overrides enabling features and potentially imply that when relocating, older women should allow themselves time to adjust to environmental differences.

Clinically, when treating people with HF, rehabilitation professionals direct their attention to physically demanding activities because endurance-related impairments are most apt to be manifested in activities that require moving or carrying heavy objects or sustained movement, such as light and heavy housework and walking substantive distances (Guccione et al., 1994; Pinsky et al., 1990). Thus, while it was not surprising to find that 3 of 4 of our physical-IADL were negatively affected by the clinic environment, our findings raise concern about the validity of assessing these activities in an unfamiliar setting. Inferring in-home performance from clinic data may suggest more disability than occurs in the real-life situation.

In contrast to our findings of environmental sensitivity with regard to the physical-IADL, which were anticipated from the HF diagnosis, those that emerged in regard to the cognitive-IADL were not anticipated. In fact, the cognitive-IADL domain was the most affected by environmental change with 7 of 14 activities performed less well under clinic than home conditions: telephoning, repairing a flashlight, identifying and resolving home safety concerns, preparing a light meal (e.g., using the stove to heat soup, manipulating a sharp utensil to cut fruit), paying bills by check, and balancing a check ledger). Cognitive impairments, such as deficits in attention, memory and learning have been associated with the HF disease process (Almeida & Flicker, 2001) as well as the normal aging process (Riley, 2001). Nonetheless, our test results on the Modified Mini-Mental State, Trails A and B, and the Geriatric Depression Scale, indicated that our sample was neither cognitively impaired nor depressed. Furthermore,

by their very nature, the daily living activities that we tested were overlearned, habitual, well-practiced tasks. The fact that even small differences in the activity situation led to discernible reductions in independence and adequacy, and to a considerably lesser extent safety, raises further concern about assessing function in unfamiliar environments. Performance evaluated as dependent, unsafe, or inadequate in the clinic may be independent, safe, or adequate in the home. Studies of older participants with knee osteoarthritis (Rogers et al., 2003) and visual impairment (West et al., 1997) yielded a similar trend.

The most commonly assessed activities in rehabilitation are in the functional mobility and personal care domains, and the most commonly measured performance parameter is functional independence. In contrast to the underestimation of performance in the clinic observed in regard to the cognitive and physical-IADL domains, independence was overestimated in the clinic, compared to the home, for the functional mobility and personal care domains, although safety and adequacy were rated as equivalent. Similar findings emerged from other studies (Arenth & Mamom, 1985; Egan et al, 1992; Sheikh et al., 1979; Strub & Levine, 1987). Interestingly, the activity level analysis suggested that the clinic promoted independence for ascending and descending stairs at the expense of safety. Multiple enabling features may account for improved independence in the clinic, including handrails on both sides of the staircase, a short staircase, a large landing for turning, and good lighting. It is unclear why these same features failed to promote safety.

Of the 26 activities examined half emerged as being particularly environmentally sensitive: in functional mobility, stair use; in personal care, oral hygiene and toenail care; in the cognitive-IADL, telephone use, flashlight repair, home safety, stove use, check management, mailing bills, use of knives; in the physical-IADL, meal clean-up, changing bed linens, and

sweeping the floor. When assessing these activities, practitioners need to be mindful of environmental influences on them. When the purpose of assessment is to ascertain current functional status, features of the activity context of the home should be duplicated in the clinic as much as possible, when assessment in the home is not practical (Dorevitch et al., 1992). When the purpose of the assessment is to ascertain functional potential, the clinic environment should be made as enabling as possible. A dynamic assessment approach (Rogers & Holm, 2000; Tzuriel & Haywood, 1991; Vygotsky, 1978), in which the practitioner actively intervenes to facilitate effective use of the enabling features, should be used to optimize performance.

The disparities in activity performance between the home and clinic should not obscure the similarities. At the activity level, 20 of 26 activities were performed as independently in the clinic as in the home; 14 of 17 were performed as safely in both settings, and 16 of 26 were performed as adequately in both settings. Of the 26 activities, more than half were rated similarly for independence, safety, and adequacy in the clinic as in the home. As interpreted according to the International Classification of Functioning, Disability and Health (World Health Organization, 2001), activity capacity matched activity performance. That is to say, the ability to execute these activities in the uniform, standardized environment validly reflected the ability to execute them in the usual environment in which the activities take place. Thus, for the majority of activities the ratings made by practitioners in the clinic are more apt to be a valid index of in-home performance than invalid.

This study had several limitations. First, because assessment in the clinic preceded assessment in the home it is possible that some activities were performed better in the home due to an order effect. Arguing against this interpretation however is the fact that our test of functional activities consisted of daily living activities routinely 'practiced' in the home and that

two activities (stair use, trimming toenails) were performed more independently under the enabling conditions of the clinic. Second, our sample was drawn from one academic medical center and was primarily Caucasian. Persons seeking healthcare in other settings and of other races were not adequately represented.

In conclusion, our findings indicate that we cannot make a general statement about the enabling/disabling influence of the environment on the activity performance of community dwelling older women with HF. We found that the impact of the environment on activity performance depended on the measurement parameter, activity domain, or individual activity being analyzed. Further studies should replicate these methods with a wider range of disease populations to assess the generalizability of the findings.

4. TRAJECTORY OF DISABILITY OVER SIX MONTHS IN OLDER WOMEN WITH HEART FAILURE COMPARED TO A WELL COHORT OF OLDER WOMEN WITHOUT DISABLING DISEASES

4.1. BACKGROUND

Heart failure (HF) is a pathophysiological disease characterized by the inability of the heart to pump blood at a rate required by the metabolizing tissues in the body (van Jaarsveld, Sanderman, Miedema, Ranchor, & Kempen, 2001). It is caused by conditions such as coronary artery disease, myocardial infarctions, arrhythmias, and valvular heart disease. Over 5 million Americans are diagnosed with heart failure, with 550,000 new cases diagnosed each year (American Heart Association, 2004). While prevalence rates for HF are equal among women and men, women account for 62% of total deaths due to heart failure. Older women with HF also report more activity limitations in basic and instrumental activities of daily living compared to men (Pinsky, Jette, Branch, Kannel, & Feinleib, 1990). Riedinger et al. (2000) suggested that studies evaluating functional capacity and the ability to perform household chores in this population are needed.

In HF, disease-associated impairments in cardiovascular structure and function manifest themselves primarily in dyspnea and resulting disability. People with HF have disability in an estimated 1.5 basic activities of daily living (BADL; e.g., walking, dressing) and 2 instrumental activities of daily living (IADL; e.g., home management) (Chin et al., 1998). In the Framingham

study, relationships between disability and cardiovascular disease, including HF, that were not apparent when the cohort was younger (Pinsky et al., 1990) emerged as the cohort aged (Guccione et al., 1994). Increases in disability have been detected in the year following HF diagnosis (van Jaarsveld et al., 2001) as well as the year following hospitalization for HF (Burns et al., 1997), with failure to return to baseline functioning. In HF patients, hospitalization, whether for HF or other medical condition, has been associated with increased disability (Wolinsky et al., 1997) and increased disability has been associated with mortality (Bittner et al., 1993; Chin et al., 1998). Changes in function generally occur gradually as opposed to precipitous decline (Chin et al., 1998) and decline may be related to self-efficacy beliefs (Kempen et al. 2000), cognitive impairment (Almeida & Flicker, 2001), or depression (Turvey, Schultz, Arndt, Wallace, & Herzog, 2002) rather than cardiovascular deterioration.

Although dyspnea is likely to have the greatest impact on high aerobic activities, activities defined as "high aerobic" are classified under BADL as well as IADL. Guccione et al. (1994) found that four activities had the strongest association with HF – stair climbing, heavy home chores, grocery shopping, and carrying bundles. Burns et al. (1997) ascertained that one-third of their HF sample (n = 519) experienced shortness of breath when walking less than 1 block, and the 6-Minute Walk Test predicted morbidity in HF patients (Bittner et al., 1993). Because walking is involved in many functional activities, walking disability may be the underlying cause of dependencies in BADL and IADL. For example, in a HF sample the functional mobility activities, transferring and ambulation, clustered with other BADL (dressing, eating, toileting, bathing, and continence) as well as the IADL telephoning. Getting around outside, going up and down stairs, walking a minimum of 400 meters also tended to cluster

together but were grouped with the more difficult BADL, specifically, bathing and cutting toenails (Incalzi et al., 2005).

The current study, which examined the 6 month trajectory of activity limitations in older women with HF, was unique in several respects. First, activity limitation was measured objectively, through performance-based assessment, rather than subjectively, through self or proxy reports. Self and proxy reports yield data about perceived disability as opposed to actual disability. Hence, it is not surprising that poor to fair concordance has been found between subjective and objective measures (Kempen, Sullivan, van Sonderen, & Ormel, 1999; Magaziner, Zimmerman, Gruber-Baldini, Hebel, & Fox, 1997; Rogers, Holm, Beach, Schulz, Cipriani, Fox, et al., 2003; Wijlhuizen & Ooijendijk, 1999; Yasuda, Zimmerman, Hwakes, Gruber-Baldini, Hebel, & Magaziner, 2004). Second, we expanded disability assessment from activity independence to activity safety and adequacy. Independence accounts for the ability to initiate, continue and complete activities without human assistance, while safety considers risks to the client, others, and the environment and adequacy examines the quality of the activity process and its outcome. Activity independence is not always synonymous with safe and adequate performance (Rogers et al., 2001) and individuals may experience more disability if performance characteristics other than independence are considered. For example, people may climb stairs independently but use their hands on the railings to pull their body weight up (i.e., inadequate) and fail to clear the stairs with their feet (i.e., unsafe). Thirdly, sensory, motor, cognitive, and affective abilities were examined simultaneous with disability in an attempt to elucidate the impairments underlying emerging dependencies. Lastly, we included a comparison group of well older women, who were without disabling disease to shed light on age-related as opposed to HF-related functional changes.

4.2. METHODS

4.2.1. Design

This was a longitudinal study of two groups of older women – those with heart failure (HF) and those without a disabling diagnosis (WELL) – with assessments done at baseline (Time 1) and 6 months later (Time 2). Disability was assessed with the Performance Assessment of Self-Care Skills-Home (PASS-H) and impairment with the Skill Attribute Battery (SAB) (see Figure 4-1).

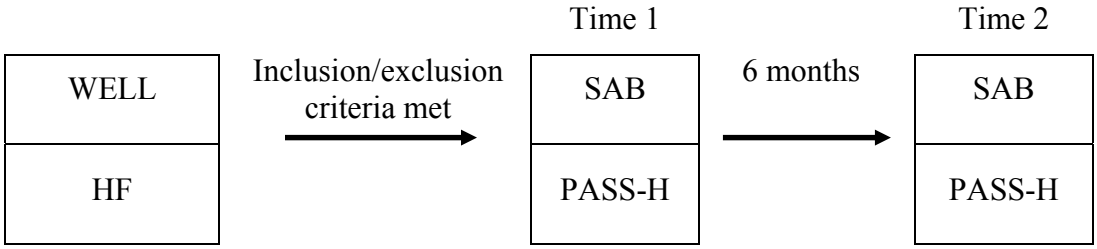

Figure 4-1: Flow Diagram of the Design of the Study.

Note. WELL = Group with no disabling disease. HF = Group with heart failure. SAB = Skill Attribute Battery. PASS-H = Performance Assessment of Self-care Skills – Home.

4.2.2. Participants

Fifty-seven older women with no disabling diagnoses (WELL) and 55 older women with a primary diagnosis of heart failure (HF), living in metropolitan Pittsburgh, Pennsylvania, participated in this study. To be included in the study, the participants had to: (1) be female; (2) be at least 70 years of age; (3) be living in the community; (4) be medically stable; (5) have a Mini-Mental State Examination Score (MMSE) ≥ 24 (Folstein, Folstein, & McHugh, 1975) (6) have a history of successful performance of activities of daily living on the OARS

Multidimensional Functional Assessment BADL and IADL items (OARS) (Fillenbaum, 1988; Fillenbaum & Smyer, 1981); and, (7) have no significant, uncorrected hearing or visual impairment. Participation was restricted to women, because for the current generation of older adults, the majority of IADL activities associated with independent living have been traditionally done by women (e.g., shopping, meal preparation, and sweeping). A history of successful performance of IADL was required to rule out activity limitation attributable to a lack of learning or skill.

In addition to the above inclusion criteria; participants recruited for the WELL group had to report no limitations in basic and instrumental activities of daily living on the OARS. The exclusion criterion for the WELL group was a disabling diagnosis, such as dementia (i.e., MMSE ≤ 24), major depression, macular degeneration, osteoarthritis, or heart failure.

Participants recruited for the HF group had to have a primary diagnosis of HF, as determined by their primary care physician, and had to report on the OARS that their HF was severe enough to interfere with at least one basic or instrumental activity of daily living. The exclusion criterion for this group was a secondary disabling diagnosis, such as dementia, major depression, macular degeneration, or osteoarthritis.

4.2.3. Measures

Data regarding activity were collected using the home version of the Performance Assessment of Self-Care Skills (PASS-H). Data regarding sensory, motor, cognitive, and affective impairments were collected to explain the trajectory of activity limitations in the WELL and HF groups and to describe the samples. Demographic data and a measure of health were also collected.

4.2.3.1. Activity

The Performance Assessment of Self-Care Skills (PASS-H) is a standardized observational tool designed to document the performance of 26 daily living activities and 163 subactivities (Rogers & Holm, 1989).

Item scoring is based on an analysis of the critical subactivities needed to complete the activity. Bed transfers, for example, contains six subactivities. Each activity is rated for independence, safety, and adequacy on ordinal scales ranging from 0 – 3; higher scores indicate greater independence, safety, or adequacy. Independence scores are based on the type and frequency of assistance or cues provided by the examiner for each subactivity. The independence score for an activity is the mean of the subactivity scores. Safety takes into account risks to the client or the environment that occur while the activity is completed. The lowest safety observation for any subactivity becomes the safety score for that activity. Safety is rated for 17 of the 26 activities because the remaining 9 activities present no immediate risks to physical safety (e.g., reading a newspaper article). Activity adequacy considers the efficiency with which the activity is carried out and the quality of the product. The lowest adequacy observation for any subactivity becomes the adequacy score for that activity. PASS measurement parameter scores, that is the total scores, are the means for independence, safety, and adequacy scores for all activities.

Content validity of the PASS is referenced to common geriatric BADL/IADL instruments (Holm & Rogers, 1999), specifically, the OARS Multidimensional Functional Assessment Questionnaire – Activities of Daily Living (Pfeiffer, 1976), the Comprehensive Assessment and Referral Evaluation (Gurland, Kuriansky, Sharpe, Simon, Stiller, & Birkett, 1977), the rating scales for Physical Self-Maintenance and Instrumental Self-Maintenance (Lawton, Moss, Fulcomer, & Kleban, 1982), and the Functional Assessment Questionnaire (Pfeffer, 1987). See

Appendix A (see Table 6-1 and Table 6-2) for detailed information regarding test-retest and inter-observer reliability for the home version of the PASS.

4.2.3.2. Impairment Measures

The Skill Attribute Battery (SAB) measures sensory, motor, cognitive, and affective impairments using standardized or clinical assessments. Sensory measures were visual acuity using a portable vision screener, and functional hearing using an adaptation of the Sent-Ident (Erber, 1992). Motor assessments were grip strength using a Jamar dynamometer (Mathiowetz et al., 1984), Functional Reach (Weiner, Duncan, Chandler, & Studenski, 1992), and the Keitel Functional Test (KFT) (Eberl et al., 1976). While administering the walking 30 meters, ascending 10 steps, and descending 10 steps items of the KFT, we also recorded the time it took the participants to complete these items. The cognitive measures were the Modified Mini-Mental State (3MS) (Teng & Chui, 1987) and Trail Making – Parts A and B (Reitan, 1958). The affective measure was the Geriatric Depression Scale (GDS) (Sheikh & Yesavage, 1986). See Appendix C (see Table 6-4) for detailed information regarding the impairment measures in the Skill Attribute Battery.

4.2.3.3. Demographic and Health Status Measures

Demographic data, which were collected on a study devised form, were age, ethnic background, education, marital status, living arrangements, and household income. Health status, conceptualized as medical burden, was rated on the Cumulative Illness Rating Scale for Geriatrics (CIRS-G) (Miller & Towers, 1991; Miller et al., 1992). Each of the 14 items comprising the scale represents a human system (heart; vascular; hematopoietic; respiratory; eyes; ear; nose; throat and larynx; upper gastrointestinal; lower gastrointestinal; liver; renal;

genitourinary; musculoskeletal/integument; neurologic; endocrine/metabolic and breast; and psychiatric) and is rated on a 5-point ordinal scale ranging from 0 (no problem) to 4 (extremely severe problem). The scores from the 14 items are summed to calculate a total score. Scores range from 0 to 56, with higher scores indicative of greater medical burden.

4.2.4. Procedures

University of Pittsburgh Institutional Review Board approval was obtained prior to the start of this study. Potential participants were recruited from the outpatient service at the Benedum Geriatric Center of the University of Pittsburgh Medical Center Health System. Patients potentially meeting study criteria were referred to the study with the approval of their physicians. Study requirements were explained and informed consent was obtained from those willing to participate. A project geriatrician reviewed the medical records to confirm the diagnostic criteria. The OARS BADL and IADL items were administered verbally to ascertain if activity performance criteria were met. Assessments were scheduled within 5 days of eligibility criteria verification. The SAB was administered on day 1 of study participation at the Benedum Geriatric Center. The PASS-H was administered in the home on day 3. The CIRS-G was completed either by the participant's personal physician or a project physician assistant. The SAB and PASS-H were repeated after 6 months. All assessments were administered by trained assessors.

4.2.5. Data Analysis

Demographic and health status measures. For the demographic and health status measures, descriptive statistics were used to describe the samples, by group. Comparisons were made between-groups using independent samples *t*-tests and chi-square tests (with Bonferroni corrections) as appropriate.

Impairment measures. For the impairment measures, descriptive statistics were used to describe the samples, by group and time. Between-groups comparisons for the impairment measures were conducted for time 1 and time 2 using independent samples *t*-tests and chi-square tests (with Bonferroni corrections) as appropriate. Within-groups comparisons for the impairment measures between time 1 and time 2 were made using dependent samples *t*-tests with Bonferroni corrections.

Activity measures. For the activity measures, descriptive statistics were used to describe the samples, by group and time. To compare the trajectory of activity limitations over time for the independence, safety, and adequacy PASS total scores, three separate two-way mixed ANOVAs were conducted with the group (WELL and HF) as the between-subjects factor and time (time 1 and time 2) as the within-subjects factor. If the analysis revealed a violation of Mauchly's sphericity assumption, adjustments were made to the ANOVA results, using the Greenhouse-Geisser epsilon (Field, 2002).

Post-hoc analyses comparing the PASS total scores between-groups at time 1 and time 2 were carried out using independent samples *t*-tests (with Bonferroni corrections). Within-groups comparisons for the PASS total scores between time 1 and time 2 were made using paired samples *t*-tests (with Bonferroni corrections).

4.3. RESULTS

4.3.1. Demographic and Health Status Measures

The 57 participants in the WELL group had a mean age ± standard deviation (SD) of 78.7 ± 2.9 years, and were primarily white, widowed, and lived alone. The majority had a high school diploma and a yearly household income of less than $ 50,000. The two groups did not differ significantly in their demographics (see Table 4-1). As anticipated, medical burden at time 1 was significantly lower for the WELL group compared to the HF group on the CIRS-G (see Table 4-1). The majority of participants in the HF group had moderate (45.5%) to severe (27.3%) problems in the CIRS-G heart category; moderate (52.7%) problems in the vascular category; and moderate (25.5%) to severe (18.2%) problems in the respiratory category.

Table 4-1: Descriptive and Between Group Comparison Statistics for the Demographic Characteristics and Health Status Measure for the WELL and HF Groups

Variable (score range)	WELL group (n = 57)	HF group (n = 55)	Test[a]
Demographics			
Age, mean ± SD, years	78.7 ± 2.9	78.3 ± 5.3	0.5
Ethnic background, %			1.3
White	86.0	83.6	
Black	12.3	16.4	
Education, %			5.6
Less than high school	12.4	21.9	
High School graduate	63.2	58.2	
College graduate	14.0	12.7	
Graduate/professional training	10.5	7.3	
Marital status, %			10.4
Single	1.8	9.1	
Married	28.0	10.9	
Widowed	63.2	72.7	
Separated	3.5	1.8	
Divorced	3.5	5.5	
Living status, %			4.4
Alone	66.7	80.0	
With spouse	26.3	10.9	
With children	7.0	9.1	
Household income, %			10.1
$ 9,999 or less	24.4	37.5	
$ 10,000 - $ 49,999	63.3	58.4	
$ 50,000 or more	12.2	4.2	
Health Status, mean ± SD			
Cumulative Illness Rating Scale for Geriatrics (0 – 56[b])	7.9 ± 3.9	12.3 ± 3.9	-5.9*

Note. [a] Means were compared with *t* tests, percentages were compared with chi-squared tests. [b] Higher score indicates greater medical burden.
*$p < .05$.

4.3.1.1. Impairment Measures

At time 1, a significantly greater proportion of participants in the WELL group had better visual acuity in the right eye compared to participants in the HF group but left eye acuity was comparable. Scores for the Sent-Ident were also comparable, with both groups accurately repeating 92% of the sentences on the first try. In both samples, functional vision and hearing

were adequate for study participation. For the motor impairment measures, the WELL group scored significantly better (lower scores) on the Keitel Functional Test, a measure of movement capability, and took significantly less time to walk 30 meters, and ascend and descend 10 steps. The WELL group was within normal limits for walking and stair use, while the HF group exceeded the standard times. Grip strength and balance were also within normal limits for both groups and did not differ. Likewise, the WELL and HF groups were similar on the cognitive measures and neither group was impaired. Participants in the HF group endorsed significantly more depressed symptoms on the GDS, but neither group was depressed.

At time 2, results of the impairment measures were similar to those of time 1, with several exceptions. The scores of the WELL group on the KFT total tool increased slightly, and scores for the WELL and HF groups were no longer significantly different. Group differences on the 3 KFT items – walking, ascending and descending stairs – remained. Scores on the GDS also increased significantly over 6 months, with both groups endorsing a similar level of depressive symptoms at time 2 by reaching the suggested cutoff score for mild depression.

Table 4-2: Descriptive and Between Group Comparison Statistics for the Impairment Measures for the WELL and HF Groups at Time 1

Variable (score range)	WELL group (n = 57)	HF group (n = 55)	Test[a]
Sensory			
Visual acuity – right eye, %			5.6*
20/20 – 20/100	86.0	67.3	
20/200 – 20/800	14.0	32.7	
Visual acuity – left eye, %			0.9
20/20 – 20/100	89.3	83.0	
20/200 – 20/800	10.7	17.0	
Sent-Ident, mean ± SD, (0 – 25[b])	23.7 ± 2.1	23.2 ± 2.7	1.3
Motor, mean ± SD			
Grip strength, mean ± SD – kilograms[b]			
Dominant hand	19.4 ± 4.3	19.2 ± 4.8	0.30
Non-dominant hand	18.3 ± 3.9	16.9 ± 4.8	1.6
Keitel Functional Test (4 – 100[c])	16.1 ± 7.1	21.4 ± 9.4	-3.5**
Keitel Functional Test – walking 30 meters - seconds[d]	21.9 ± 5.5	28.0 ± 12.2	-3.8**
Keitel Functional Test – ascending 10 steps - seconds[e]	7.7 ± 6.6	10.4 ± 10.9	-2.5**
Keitel Functional Test – descending 10 steps - seconds[e]	6.6 ± 2.1	10.0 ± 10.0	-3.1**
Functional Reach, inches[b]	11.2 ± 2.5	11.0 ± 2.4	0.3
Cognitive, mean ± SD			
Modified Mini-Mental State (0 – 100[b])	93.8 ± 5.7	92.3 ± 5.0	1.4
Trail Making – Part A - seconds[c]	49.5 ± 28.8	49.5 ± 17.5	-0.0
Trail Making – Part B - seconds[c]	121.8 ± 70.8	136.2 ± 66.1	-1.1
Affective, mean ± SD			
Geriatric Depression Scale (0 – 15[c])	1.2 ± 1.7	2.4 ± 3.9	-3.1**

Note. [a] Means were compared with independent samples *t* tests, percentages were compared with chi-squared tests. [b] Lower score indicates greater impairment. [c] Higher score indicates greater impairment. [d] Standard time = 20 seconds. [e] Standard time = 7 seconds.
* $p < .013$ (after Bonferroni corrections). ** $p < .004$ (after Bonferroni corrections).

Table 4-3: Descriptive and Between Group Comparison Statistics for the Impairment Measures for the WELL and HF Groups at Time 2

Variable (score range)	WELL group (n = 57)	HF group (n = 55)	Test[a]
Sensory			
Visual acuity – right eye, %			6.7*
20/20 – 20/100	90.4	70.6	
20/200 – 20/800	9.6	29.4	
Visual acuity – left eye, %			2.6
20/20 – 20/100	86.5	74.0	
20/100 – 20/800	13.5	26.0	
Sent-Ident, mean ± SD, (0 – 25[b])	23.5 ± 2.4	23.3 ± 2.8	0.3
Motor, mean ± SD			
Grip strength, mean ± SD – kilograms[b]			
Dominant hand	18.8 ± 4.8	18.5 ± 4.9	0.3
Non-dominant hand	17.1 ± 4.6	16.5 ± 4.8	0.7
Keitel Functional Test (4 – 100[c])	20.1 ± 7.9	23.5 ± 8.9	-2.1
Keitel Functional Test – walking 30 meters - seconds[d]	22.2 ± 3.7	28.8 ± 12.1	-3.8*
Keitel Functional Test – ascending 10 steps - seconds[e]	7.2 ± 3.0	11.9 ± 13.4	-2.5*
Keitel Functional Test – descending 10 steps - seconds[e]	7.4 ± 2.9	11.0 ± 7.7	-3.2*
Functional Reach, inches[b]	12.1 ± 2.5	11.6 ±3.5	0.8
Cognitive, mean ± SD			
Modified Mini-Mental State (0 – 100[b])	92.2 ± 6.1	91.4 ± 5.4	0.7
Trail Making – Part A - seconds[c]	50.5 ± 43.6	56.3 ± 33.9	-0.8
Trail Making – Part B - seconds[c]	121.0 ± 67.2	132.1 ± 56.4	-0.9
Affective, mean ± SD			
Geriatric Depression Scale (0 – 15[c])	5.1 ± 0.8	5.5 ± 1.4	-1.7

Note. [a] Means were compared with independent samples *t* tests, percentages were compared with chi-squared tests. [b] Lower score indicates greater impairment. [c] Higher score indicates greater impairment. [d] Standard time = 20 seconds. [e] Standard time = 7 seconds.
* $p < .013$ (after Bonferroni corrections). ** $p < .004$ (after Bonferroni corrections).

In general, for the WELL group, scores improved between time 1 and time 2 for visual acuity in the right eye, ascending 10 steps, functional reach, and trail making-part B; and scores deteriorated over time for the rest of the variables (see Table 4-4). However, these differences over time were statistically significant for the total KFT and GDS scores only. For HF group, scores improved between time 1 and time 2 for visual acuity in the right eye, functional reach, and trail making-part B; and scores deteriorated over time for the rest of the variables (see Table 4-4). These differences were statistically significant for the GDS scores only.

Table 4-4: Descriptive and Within Group Comparison Statistics for the Impairment Measures for the WELL and HF Groups

Variable (Score ranges)	WELL group (n = 57)			HF group (n = 55)		
	Time 1	Time 2	Test[a]	Time 1	Time 2	Test[a]
Sensory						
Visual acuity – right eye, %			-0.7			-0.5
20/20 – 20/100	86.0	90.4		67.3	70.6	
20/200 – 20/800	14.0	9.6		32.7	29.4	
Visual acuity – left eye, %			-0.8			-1.1
20/20 – 20/100	89.3	86.5		83.0	74.0	
20/100 – 20/800	10.7	13.5		17.0	26.0	
Sent-Ident, mean ± SD, (0 – 25[b])	23.7 ± 2.1	23.5 ± 2.4	1.0	23.2 ± 2.7	23.3 ± 2.8	-0.8
Motor, mean ± SD						
Grip strength, mean ± SD – kilograms[b]						
Dominant hand	19.4 ± 4.3	18.8 ± 4.8	1.2	19.2 ± 4.8	18.5 ± 4.9	1.9
Non-dominant hand	18.3 ± 3.9	17.1 ± 4.6	2.6	16.9 ± 4.8	16.5 ± 4.8	1.4
Keitel Functional Test (4 – 100[c])	16.1 ± 7.1	20.1 ± 7.9	-4.8*	21.4 ± 9.4	23.5 ± 8.9	-2.1
Keitel Functional Test – walking 30 meters - seconds[d]	21.9 ± 5.5	22.2 ± 3.7	-0.6	28.0 ± 12.2	28.8 ± 12.1	-1.5
Keitel Functional Test – ascending 10 steps - seconds[e]	7.7 ± 6.6	7.2 ± 3.0	0.6	10.4 ± 10.9	11.9 ± 13.4	0.5
Keitel Functional Test – descending 10 steps - seconds[e]	6.6 ± 2.1	7.4 ± 2.9	-2.5	10.0 ± 10.0	11.0 ± 7.7	-0.1
Functional Reach, inches[b]	11.2 ± 2.5	12.1 ± 2.5	-2.6	11.0 ± 2.4	11.6 ±3.5	-1.2
Cognitive, mean ± SD						
Modified Mini-Mental State (0 – 100[b])	93.8 ± 5.7	92.2 ± 6.1	2.2	92.3 ± 5.0	91.4 ± 5.4	1.6
Trail Making – part A - seconds[c]	49.5 ± 28.8	50.5 ± 43.6	0.8	49.5 ± 17.5	56.3 ± 33.9	-2.2
Trail Making – part B - seconds[c]	121.8 ± 70.8	121.0 ± 67.2	0.8	136.2 ± 66.1	132.1 ± 56.4	0.4
Affective, mean ± SD						
Geriatric Depression Scale (0 – 15[c])	1.2 ± 1.7	5.1 ± 0.8	-20.6*	2.4 ± 3.9	5.5 ± 1.4	-12.7*

Note. [a] Means were compared with independent samples *t* tests, percentages were compared with chi-squared tests. [b] Lower score indicates greater impairment. [c] Higher score indicates greater impairment. [d] Standard time = 20 seconds. [e] Standard time = 7 seconds.

*$p < .004$ (after Bonferroni corrections).

4.3.1.2. Activity Measures

Descriptive statistics for the PASS total measurement parameter scores for time 1 and time 2 for the WELL and HF groups are detailed in Table 4-5. Because the PASS is a criterion-referenced as opposed to a norm-referenced test, and because the WELL participants reported no activity limitations, and all participants were community-dwelling and actively participated in caring for themselves and their homes, some ceiling effects were expected on the PASS-H. Deviations from the ceiling for independence and adequacy (3.0) are greater in the HF group than the WELL group, and tend to become more marked over time. Both groups exhibit a trend toward needing more frequent verbal assistance to needing some physical assistance. For safety, in contrast, both groups achieved near perfect scores at time 1 and maintained that level at time 2.

Table 4-5: Descriptive Statistics for the PASS Total Measurement Parameter for Time 1 and Time 2 for the WELL and HF Groups

Variable (Score range)	WELL group (n = 57)				HF group (n = 55)			
	Time 1		Time 2		Time 1		Time 2	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Measurement Parameter (0 – 3[a])								
Independence	2.8	0.1	2.7	0.2	2.6	0.2	2.5	0.3
Safety	3.0	0.1	2.9	0.1	2.9	0.1	2.9	0.1
Adequacy	2.8	0.2	2.7	0.2	2.6	0.3	2.4	0.3

Note. [a] Lower score indicates greater activity limitations.

PASS total scores - Independence. A 2 (group) X 2 (time) mixed factor ANOVA for the PASS independence total scores, revealed significant main effects for group, F (1, 106) = 34.43, $p < .001$, and time, F (1, 106) = 64.12, $p < .001$ (see Table 4-6). The group X time interaction was not significant.

Table 4-6: Two-factor Mixed ANOVA for the WELL and HF Groups and Time for PASS Independence Total Scores

Analysis/Source	*df*	*SS*	*MS*	*F*
Between Subjects				
Group	1	2.20	2.20	34.43*
Error (between)	106	6.77	0.06	
Within-Subjects				
Time	1	1.03	1.03	64.12*
Group X Time	1	0.00	0.00	0.02
Error (within)	106	1.70	0.02	

Note. * $p < .05$

Between subjects differences were analyzed with independent samples t-tests (with Bonferroni corrections $p < .025$), and revealed that independence scores were significantly higher for the WELL group compared to the HF group at time 1 and at time 2 (see Table 4-7).

For within subjects comparisons, paired samples *t*-tests (with Bonferroni corrections $p < .025$) revealed that independence scores were significantly higher at time 1 compared to time 2 in both groups (see Table 4-7).

Table 4-7: t- test results at Time 1 and Time 2 for the WELL and HF groups for the PASS Total Scores for Independence

		WELL group		HF group		*t*	*p*
		M	*SD*	*M*	*SD*		
Between →	Time 1	2.8	0.1	2.6	0.2	5.81	<.001*
	Time 2	2.7	0.2	2.5	0.3	4.82	<.001*
Within ↓	*t*	6.47		5.10			
	p	<.001*		<.001*			

Note. * p < .025 (with Bonferroni corrections)

PASS total scores - Safety. A 2 (group) X 2 (time) mixed factor ANOVA for the PASS safety total scores, revealed no main effects for group, F (1, 106) = 0.25, p = 0.621, or time, F (1, 106) = 0.34, p = 0.572 (see Table 4-8). The group X time interaction was not significant either.

Table 4-8: Two-factor Mixed ANOVA for the WELL and HF Groups and Time for PASS Safety Total Scores

Analysis/Source	*df*	*SS*	*MS*	*F*
Between Subjects				
Group	1	0.00	0.00	0.25
Error (between)	106	0.54	0.01	
Within-Subjects				
Time	1	0.00	0.00	0.34
Group X Time	1	0.00	0.00	0.32
Error (within)	106	0.52	0.01	

Note. * $p < .05$

PASS total scores - Adequacy. A 2 (group) X 2 (time) mixed factor ANOVA for the PASS adequacy total scores, revealed significant main effects for group, F (1, 106) = 28.15, p < .001, and time, F (1, 106) = 45.05, p < .001 (see Table 4-9). The group X time interaction was not significant.

Table 4-9: Two-factor Mixed ANOVA for the WELL and HF Groups and Time for PASS Adequacy Total Scores

Analysis/Source	*df*	*SS*	*MS*	*F*
Between Subjects				
Group	1	2.63	2.63	28.15*
Error (between)	106	9.90	0.09	
Within-Subjects				
Time	1	0.93	0.93	45.05*
Group X Time	1	6.45	6.45	0.00
Error (within)	106	2.19	0.02	

Note. * p < .05

Between subjects differences were analyzed with independent samples t-tests (with Bonferroni corrections p < .025), and revealed that adequacy scores were significantly higher for the WELL group compared to the HF group at time 1 and at time 2 (see Table 4-10). For within subjects comparisons, paired samples t-tests (with Bonferroni corrections p < .025) revealed that adequacy scores were significantly higher at time 1 compared to time 2 in both groups (see Table 4-10).

Table 4-10: t- test results at Time 1 and Time 2 for the WELL and HF groups for the PASS Total Scores for Adequacy

		WELL group		HF group		*t*	*p*
		M	*SD*	*M*	*SD*		
Between →	Time 1	2.8	0.2	2.6	0.3	5.41	<.001*
	Time 2	2.7	0.2	2.4	0.3	4.40	<.001*
Within ↓	*t*	5.57		4.16			
	p	<.001*		<.001*			

Note. * p < .025 (with Bonferroni corrections)

4.4. DISCUSSION

The purpose of this study was to examine the trajectory of activity limitations over 6 months in older women with heart failure, compared to a well cohort without disabling diseases. We examined three measurement parameters (independence, safety, adequacy) in two groups (WELL and HF) over 6 months. We also examined an array of sensory, motor, cognitive, and affective functions to shed light on any differences detected in activity between the WELL and HF groups or any changes in activity that emerged over 6 months.

Participants in the HF group were expected to be less independent than those in the WELL group because self-reported disability in at least one ADL was an inclusion criterion for the HF group. Over time, independence decreased in both the HF and WELL groups and the rate of decline in the two groups did not differ significantly. Clinically, the WELL group demonstrated an increased need for occasional verbal assistance, while the HF group required more continual verbal assistance or some physical assistance at follow-up. A loss of functional independence over 1 year has been well documented in studies of older adults (Avlund, Davidsen, & Schultz-Larsen, 1995; Branch & Jette, 1981; Jette & Branch, 1981; Mor, Wilcox,

Rakowski, & Hirish, 1994,), including those with HF (Chin, et al., 2003; Wolinsky, et al., 1997), but less well documented over a shorter duration (Burns et al, 1997; Kempen et al., 2000; van Jaarsveld et al., 2001). In those with HF, loss typically followed a medical event, whereas our performance assessment detected loss over a short period in persons who were medically stable.

Unlike participants in the HF group, those in the WELL group were not expected to demonstrate dependence, because they self-reported no activity limitations in BADL or IADL on the OARS. Yet, their mean baseline PASS independence score of 2.8 indicates that some participants required assistance to perform the routine daily living tasks. Disparities between self-perceptions of functioning and objective tests of functioning were found in our methodologic research (see Chapter 2) as well as that of other researchers (Kempen, Sullivan, van Sonderen, & Ormel, 1999; Myers, Holliday, Harvey, & Hutchison, 1993; Rogers et al., 2003; Wijlhuizen & Ooijendijk, 1999).

Our findings for activity adequacy were similar to those of independence, with the HF group demonstrating less adequate performance or outcome than the WELL group and both groups exhibiting decreased adequacy over time. When adapting to disability, humans alter the manner in which they perform activities (Fried, Herdman, Kuhn, Rubin, & Turano, 1991; Holm, Rogers, & James, 2003), perform more slowly (Schultz-Larsen, Avlund, & Kreiner, 1992), and take rest breaks to reduce fatigue (Fried et al., 1996). Adaptations such as these often precede dependency and are captured by the PASS adequacy score.

Our findings related to how safely participants performed activities contrast sharply with those related to how independently and adequately activities were performed. Perfect or near perfect (e.g., 3.0, 2.9) scores were obtained for activity safety at baseline, and unlike independence and adequacy, safety did not decline over time. Thus, when adapting to emerging

disability, whether related to HF or aging, participants compromised independence and adequacy but not safety. Similar results were obtained by Rogers et al. (2001) in a sample of older women with osteoarthritis and they reasoned that when adapting to disability, participants may compromise independence and adequacy rather than put themselves at risk of injury.

We explored potential causes of the declines observed in activity independence and adequacy by simultaneously examining changes in an array of factors known to hinder performance. Of the 16 factors considered, 6 emerged as of potential consequence to emerging disability. The shortness of breath and fatigue associated with HF, often leads to endurance impairment, and resultant disability. Thus, our surrogate measure of endurance, the Keitel Functional Test (KFT) differentiated the HF group from the WELL group. Group differences were readily apparent on the three most physically taxing items -- walking 30 meters, and ascending and descending stairs. The KFT also captured changes in physical movement over 6 months in the WELL group.

While physical impairments are the most likely HF-related cause of disability, our findings support a multifactorial approach to functional status assessment, with sensory (visual acuity) and affective (GDS) measures yielding significance between or within groups. Of these, depression and cognitive impairment are known correlates of disability (Turvey et al., 2002). Changes in visual acuity, however, are likely to be age-related than HF-related.

Our study had several limitations. First, we used a convenience sample of community dwelling older women with and without disabling diseases who volunteered to participate in our study. Thus, they may not be representative of a random sample of older women drawn from the community. Second, our sample was drawn from one academic medical center and was

primarily Caucasian. Persons seeking healthcare in other settings and of other races were not adequately represented.

5. CONCLUSION

The purpose of this dissertation was to explore activity limitations in older women with heart failure living in the community. The general aims of this dissertation were to:

1) explore the concordance of four functional assessment methods – self-report, proxy-report, clinical judgment based on impairment data, and performance-based observation in the clinic with performance-based observation in the home in older women with heart failure (HF) living in the community for four activity domains -- functional mobility, personal care, instrumental activities of daily living with a cognitive emphasis and instrumental activities of daily living with a physical emphasis.

2) examine the concordance between performance-based observation in the clinic and home for global functioning, 4 activity domains (functional mobility, personal care, cognitive-instrumental activities of daily living, physical-instrumental activities of daily living), and the 26 specific activities included in these domains

3) examine the trajectory of disability over 6 months in older women with HF, compared to the trajectory of a group of older women without disabling diseases (WELL) using data from performance-based observation in the home. A secondary aim of this study is to describe the changes in impairment over 6 months in older women with HF, compared to the WELL cohort.

The first investigation examined the concordance of four functional assessment methods – self-report (SR), proxy-report (PR), clinical judgment based on impairment data (CJ), and

performance-based observation in the clinic (PBO-C) - with performance-based observation in the home (PBO-H), which was selected as the criterion method. Overall, the findings from our methodologic study revealed fair to moderate concordance between performance-based observation of functional status in participants' homes -- the criterion method -- and self-report, proxy report, clinical judgment, and performance-based observation in the clinic depending on the domain analyzed. Fair concordance was found between in-home and in-clinic observation for the functional mobility, personal care, and cognitive instrumental activities of daily living domains, while concordance for the physically oriented instrumental activities was non-significant. For self and proxy reports, concordance with the criterion was moderate for the functional mobility domain and non-significant to fair for the other 3 domains. Clinical judgment was the least concordant with in-home observations, yielding fair concordance for functional mobility and non-significant concordance for the other 3 domains. Thus, in contrast to in-clinic observation, self and proxy reports and clinical judgment were found to validly substitute for in-home observation only for the functional mobility domain. Although testing in the clinic emerged as the best substitute for in-home testing, concordance was only fair ($r = .40 - .44$) and this was achieved for only 3 of 4 domains. Thus, the preferred assessment method for learning how older adults with HF function at home is to test them in their home.

The second investigation examined the concordance between the two performance-based observation methods in greater detail by comparing in-clinic and in-home performance observations for global functioning in independence, safety, and adequacy, the 4 activity domains (functional mobility, personal care, cognitive-instrumental activities of daily living, physical-instrumental activities of daily living), and the 26 specific activities included in these domains. Comparing the performance of the same activities in two environments -- the familiar

home and the unfamiliar but prosthetic clinic -- allowed us to explore the effect of a change of environment on routine activities. The environment was found to influence the performance of routine daily living activities in neutral, enabling and disabling ways, depending on the quality of activity examined or the level of analysis. At the global level, activity independence was the same in the clinic as it was in the home. However, at the domain level, functional mobility and personal care activities were more independent in the clinic than in the home, while the cognitively-oriented instrumental activities were less independent and no environmental effect was detected for the physically-oriented instrumental activities. At the activity level, 2 specific activities were positively influenced by the clinic and 4 were negatively influenced. Global safety, as global independence, was equivalent in the clinic and home. However, at the domain level, the cognitive and physical instrumental activities of daily living were performed less safely in the clinic than home, while functional mobility and personal care were performed as safely in both settings. Three activities were negatively influenced by the clinic. The adequacy of activity performance was less in the clinic than in the home at the global level, as well as for the two instrumental domains but the functional mobility and personal care domains were comparable. At the activity level, 1 activity was positively influenced by the clinic and 9 were negatively influenced. Thus, when women with HF experience a change of performance environment, activity adequacy is influenced to a greater extent than activity independence, while the safety of performance is the least affected by environmental change. Our findings highlight the advantage of moving beyond independence when assessing function and the positive and negative effects that an 'enabling' clinic setting can have on the performance of routine tasks by older, medically stable community residing adults.

The third study examined the trajectory of global disability over 6 months in older women with HF, compared to the trajectory of a well group of older women without disabling disease through performance-based observation in the home. A secondary aim of this study was to describe the changes in impairment over 6 months in older women with HF, compared to the WELL cohort. At both baseline and follow-up, the WELL group performed more independently and adequately than the HF group but equally as safely. Both groups exhibited declines in independence and adequacy over 6 months but remained stable in safety. Initially, the HF group had more physical impairment and endorsed more depressive symptoms, than the WELL group. At follow-up, group differences in physical impairment remained but those regarding depressive symptoms became non-significant due to increased endorsement of depressive symptoms by both groups. Although neither group was depressed at the beginning of the study, the scores of both groups reached the level of mild depression at follow-up. The WELL group also experienced an increase in their level of physical impairment.

In summary, findings from these studies suggest that performance observation in the home may be the most valid method of assessing disability, the influence of the environment on performance is variable, and older women with heart failure sustain greater activity limitations than those without disabling diseases but the rate of change over time is similar.

5.1. RECOMMENDATIONS FOR FUTURE RESEARCH

Based on the findings from the three studies, several recommendations for future research emerge. These recommendations are enumerated below:

5.1.1. Study 1

- Performance-based observations in the home may be used to further study activity outcomes thereby advancing our understanding of HF-related disability.
- Self and proxy-reports may continue to be preferable to performance-based observations in the home. Hence, further studies should explore ways to minimize the dissonances between self and proxy reports and performance-based observations in the home. One way would be to draw attention to the components of activities when self and proxy ratings of activities are done.
- Our study explored the concordance between methods at one point in time. Future studies should also explore concordance of methods over time. These studies would shed light on whether other functional assessment methods are able to pick up positive or negative changes in activity limitations.

5.1.2. Study 2

- Environment is shown to influence activity performance. Further studies should examine whether modifications to the customary home environment actually improve activity performance or does the novel unfamiliar environment hinder performance? We also need to examine whether individuals needs to become skilled in performing activities in the novel environment before they can benefit from it.
- Future studies need to compare the influence of the environment on activity performance in the home, and other novel standard environments such as assisted living facilities and/or nursing homes.

5.1.3. Study 3

- Our study examined the trajectory of activity limitations for older women with HF at the global level. Future studies need to examine this trajectory at the domain and individual activity levels.
- We also need to compare the patterns of hierarchy of activity limitations between HF and WELL groups, and determine if these patterns of hierarchy remain the same over time.
- Inter-relationship between independence, safety, and adequacy need be examined, for example, does inadequate performance predict dependent and unsafe performance over time.

5.1.4. Overall

- Our primary sample consisted of medically-stable community dwelling older women with heart failure. Further study with a sample of older women who are not medically stable and may be transitioning between living facilities is warranted.
- Future research studies may examine the validity of functional assessment methods for describing activity outcomes in a broader range of endurance-related cardiopulmonary conditions such as, chronic obstructive pulmonary diseases and pulmonary hypertension.

6. APPENDICES

APPENDIX A

TEST – RETEST RELIABILITY AND INTER – RATER RELIABILITIES FOR THE PASS – C AND PASS – H

Table 6-1: Test – Retest Reliabilities for the Performance-Assessment of Self-Care Skills

	Performance Assessment of Self-Care Skills	
	Clinic	Home
Independence	0.92*	0.96*
Safety	0.89†	0.90†
Adequacy	0.82*	0.97*

Note: * = Correlation coefficient; † = % agreement.

Table 6-2: Inter-observer Reliabilities for the PASS

	Performance Assessment of Self-Care Skills					
	Clinic			Home		
	Decision Consistency	% agreement (Range)	Kappa (Range)	Decision Consistency	% agreement (Range)	Kappa (Range)
Measurement Parameters						
Independence	3064/3272	92		3410/3564	96	0.41 (0.02 – 1.00)
Safety	310/353	93		383/405	97	0.41 (0.56 – 0.91)
Adequacy	489/546	90		547/596	88	0.35 (0.56 – 0.91)
Domains – Independence						
Functional mobility	507/525	97 (94.3 – 100)	0.43 (0.01 – 0.82)	588/595	99 (98.1 – 100)	0.74 (0.56 – 0.91)
Personal care	439/480	91 (85.7 – 93.1)	0.38 (0.16 – 0.58)	485/497	98 (96.6 – 99.8)	0.83 (0.74 – 0.97)
Cognitive-IADL	1682/1805	93 (88.9 – 100)	0.29 (0.02 – 1.00)	1868/1990	94 (92.7 – 99.7)	0.32 (0.02 – 1.00)
Physical-IADL	436/462	94 (92.1 – 97.0)	0.42 (0.03 – 0.65)	469/482	97 (95.7 – 99.8)	0.19 (0.01 – 0.72)
Domains – Safety						
Functional mobility	87/105	83 (52.4 – 100)	0.37 (0.05 – 1.00)	106/114	93 (78.3 – 100)	0.31 (-)*
Personal care	55/60	92 (81.0 – 100)	0.08 (-)	61/63	97 (96.5 – 98.9)	0.35 (0.05 – 1.00)
Cognitive-IADL	92/105	88 (71.4 – 100)	0.08 (0.05 – 0.13)	130/137	95 (87.0 – 100)	0.28 (0.05 – 0.45)
Physical-IADL	76/83	92 (76.2 – 100)	0.39 (0.13 – 0.64)	86/91	95 (86.4 – 100)	0.07 (-)
Domains – Adequacy						
Functional mobility	84/105	80 (62.0 – 90.5)	0.25 (0.05 – 0.52)	98/114	86 (73.9 – 100)	0.23 (0.05 – 0.55)
Personal care	54/63	86 (-)	0.41 (0.32 – 0.58)	61/69	88 (82.9 – 95.7)	0.50 (0.25 – 0.65)
Cognitive-IADL	277/294	94 (81.0 – 100)	0.65 (0.05 – 1.00)	303/321	95 (69.6 – 100)	0.35 (0.05 – 1.00)
Physical-IADL	74/84	88 (85.7 – 90.5)	0.32 (0.07 – 0.45)	85/92	93 (87.0 – 95.7)	0.39 (0.06 – 0.65)

Note: IADL = Instrumental activities of daily living. * Many items could not be computed.

APPENDIX B

TEST-RETEST RELIABILITIES FOR THE SELF-REPORT AND PROXY-REPORT INTERVIEW QUESTIONNAIRES

Table 6-3: Test-retest Reliabilities for the Self-Report and Proxy-report Questionnaires

	Self-report		Proxy-report	
	% agreement	ICC (r)	% agreement	ICC (r)
Total	94	0.90	89	0.98
Domains				
Functional Mobility	94	0.96	97	0.91
Personal Care	93	0.95	93	0.95
Cognitive-IADL	93	0.73	86	0.98
Physical-IADL	91	0.84	85	0.68

Note. ICC = Intraclass Correlation Coefficients. IADL = Instrumental activities of daily living.

APPENDIX C

SUMMARY OF IMPAIRMENT MEASURES IN THE SKILL ATTRIBUTE BATTERY

Table 6-4: Summary of Impairments Measures in the Skill Attribute Battery

Title	Purpose	Description	Method/Rating	Psychometric Properties	
				Reliability	Validity
Grip and pinch strength using a Jamar Dynamometer and a pinch meter (Mathiowetz, et al., 1984)	To evaluate muscle power functions of the hand	Gives a quantitative value for: • Grip strength • Palmar pinch • Lateral pinch	• Performance based, • Mean of three trials for each of the items for both dominant and non-dominant upper extremities • The mean scores are compared against norms for age and gender • Recorded in kilograms • Lower scores indicate impairment in muscle power functions	• Inter-observer: Pearson product-moment correlation coefficient was .97 – 1.00 for all tests • Test-retest reliability: Mean of three trials yielded a Pearson product-moment correlation coefficient of .81 - .93	• Concurrent: - Validity of the Jamar dynamometer and pinch meter was evaluated by suspending known weights from the center of their hand pieces - Calibration accuracy for Jamar dynamometer was ± 3% - Calibration accuracy for pinch meter was ± 1%

Table 6-4 (continued).

Jebsen-Taylor Hand Function Test (Jebsen et al., 1969)	To assess broad aspects of hand function commonly used in activities of daily living	Seven items, each administered for dominant and non-dominant hand • Writing • Turning cards • Picking up small common objects • Simulated feeding • Stacking checkers • Picking up large light objects • Picking up large heavy objects	• Performance based • Recorded in seconds taken to complete each activity with the dominant and non-dominant hand • Scores for each item are compared against norms for age and gender • Higher scores indicate impairment in hand functions	• Inter-observer: Pearson product-moment correlation coefficient was .82 – 1.00 for all tests • Test-retest: Pearson product-moment correlation coefficient of .60 - .99	• Criterion: - Moderate (r = -.64) but significant correlations between the Jebsen-Taylor Hand Function Test and the Klein-Bell Activities of Daily Living Scale (Lynch & Bridle, 1989) • Construct - Research showed that significant differences existed for persons older than 60 years old as a result of the aging process. The mean normative values by 10 year increments for 121 persons aged 60 – 89 years differed from those published previously for younger population (Hackel, Wolfe, Bang, & Canfield, 1992) - There was a wide distribution of scores between groups of patients with hemiplegia, rheumatoid arthritis, and C6-7 traumatic quadriparesis compared to a group of subjects with no known hand dysfunctions (Jebsen et al., 1969)

Table 6-4 (continued).

Keitel Functional Test (KFT) (Eberl et al., 1976)	To assess mobility of joints in the extremities and the vertebral column	• Individuals have to perform 24 motions that engage 2 or more joints in the extremities or vertebral columns. Examples of some of the items include: - forearms held horizontally; palmar surfaces pressed together; fingertips point upward - plantar surface of foot placed on chair; knee bent; patient stands very close to chair; support with one hand permitted - walking 10 steps upstairs; standard time, 7 seconds	• Performance based • Each maneuver is graded on an ordinal scale • Scores from the 24 items are summed to give a total score • Total scores range from 4 – 100 • Higher total scores are indicative of more impairments in the mobility of joint functions in the extremities and the vertebral column	• Inter-observer: The variance component between raters was only 2.5%, thus establishing high inter-observer reliability for the test • Test-retest: Coefficients of generalizability were found to be .96	• Criterion - In a study consisting of 98 subjects with classical rheumatoid arthritis (RA), the KFT was found to be a useful clinical test of disease activity in RA. Scores on the KFT showed good correlation with the Ritchie Articular Index, erythrocyte sedimentation rate, and C-reactive protein (Kalla, Kotze, Meyers, & Parkyn, 1988) • Construct - The Keitel Functional Test was found to be a sensitive measure in detecting a treatment effect in a drug trial (Bombardier & Raboud, 1991)

Table 6-4 (continued).

Performance Oriented Assessment of Balance (Tinetti, 1986)	Assesses balance during maneuvers used during normal daily activities	• 13 maneuvers that include: - sitting balance - arising from a chair - immediate standing balance - standing balance - balance with eyes closed - turning balance - nudge on sternum - neck turning - one leg standing balance - back extension - reaching up - bending down - sitting down	• Performance based • Each maneuver is graded on a 3 point ordinal scale with 2 indicating "normal" and 0 indicating "abnormal" movement • Scores from each of the 13 maneuvers are summed to give a total score • Total scores range from 0 – 26 • Lower total scores are indicative of balance impairment	• Inter-observer: 85% agreement between a physician and a nurse for individual items, with the total scores never differing more than 10%	• Criterion: - Excellent correlation with scores on the Berg Balance Scale (r = .91), and moderate correlations with stride length (r = .59 -.64) and single leg stance (r = .59 - .64) (Berg, Maki, Williams, Holliday, & Wood-Dauphinee, 1992) • Predictive: - Persons who scored < 18 on the total scale had an increased risk of falls (Lewis, 1993)

Table 6-4 (continued).

Functional reach (FR) (Duncan, Weiner, Chandler, & Studenski, 1990)	Assesses stability and balance during a self-initiated movement	• Performance based • Mean values over three trials for the individual leaning forward with the dominant upper extremity • Recorded in inches	• Inter-observer: Interclass correlation coefficient = 0.98 • Test-retest: Interclass correlation coefficient = 0.92	• Criterion validity: - Functional reach has a good correlation (.71) with Center of Pressure Excursion test (COPE) - Concurrent validity: The Functional reach test was established to have moderate to good correlation with the Mobility Skills Protocol, Instrumental Activities of Daily Living Scale, 10-foot Walking Speed, One-footed Standing, Life Space, and Tandem Walking (r = .64-.71). Fair correlation with Physical Activities of Daily Living Scale (r = .48) (Weiner, Bongiorni, Studenski, Duncan, Kochersberger, 1999) • Predictive: - A FR score of ≤ 6 inches was shown to be predictive of falls in elderly male veterans (Duncan, Studenski, Chandler, & Prescott, 1992)

Table 6-4 (continued).

Lung and Ventilatory Capacity	Assesses respiratory functions of the lungs	• Forced vital capacity (FVC), • Maximal ventilatory volume (MVV) • Forced expiratory volume (FEV1)	• Performance based • Mean of three trials for FVC, and FEV1 • One trial for MVV • Recorded in cubic centimeters	
Visual Acuity	Assesses visual acuity functions	• Visual acuity for each eye was measured using a Portable Vision Screener	• Performance based • Visual acuity ratio for each eye was recorded (e.g., 20/200)	
Sent-Ident (Erber, 1992)	Assesses hearing functions	• Test consists of 10 standardized sentences read aloud by the assessor and the subject repeating it back to the assessor • For our study, we used an adapted version that consisted of 5 of the 10 sentences	• Performance based • Each sentence is rated on a 6 point scale with 0 indicating that the "participant could not repeat the sentence" and 5 indicating that the "sentence was repeated correctly" • Scores obtained from each of the five sentences were summed to calculate a total score. • Total scores ranged from 0 - 25 • Lower scores were indicative of more impairment in hearing functions	• The Sent-Ident was able to provide guidance and strategies to formal and informal caregivers for communicating with their patients

Table 6-4 (continued).

Modified Mini-Mental State (3MS) (Teng & Chui, 1987)	To screen for cognitive impairments	Consists of 15 items The items are: - date and place of birth - registration - mental reversal - first recall - Temporal orientation - Spatial orientation - naming - four-legged animals -similarities - repetition - read and obey - writing -copying two intersecting pentagons - three stage commands - second recall	• Performance based • Each item is graded on an ordinal scale, the range for which differs from item to item • Scores from the 15 items are summed to give a total score • Total scores range from 0 – 100 • Lower scores are indicative of more impairments in cognitive functions	• Inter-observer: Pearson's correlation coefficient was .98 • Test-retest: Pearson's correlation coefficient was .93 for 108 subjects with dementia, .91 for 114 subjects with other diseases, and .91 for 27 control subjects living in the community (Teng, Chui, & Gong, 1990)	• Construct: - Four items on the 3MS (delayed recall, generating animal names, date and place of birth, copying pentagons) alone correctly classified 93% of the dementia patients and 96% of the controls in a study • Predictive - The 3 MS was found to be a significantly better predictor of functional outcome than the Mini-Mental State Examination in a study with 147 subjects with a stroke (Grace et al., 1995)

Table 6-4 (continued).

Trail Making – Parts A and B (TMT) (Reitan, 1958)	To assess cognitive impairment	• The test consists of two parts – A and B - Part A involves drawing trails to connect consecutively numbered circles on a work sheet - Part B involves drawing trails to connect consecutively numbered and lettered circles on a work sheet by alternating between the two sequences	• Performance based • The amount of time taken to complete each part is recorded separately in seconds • The scores are then compared to normative values that have been previously established	• Test-retest reliability: coefficient of concordance for three administrations to 19 normal subjects at six and 12 month intervals was .78 for Part A and .67 for Part B.	• Construct: - Performance time on the Trail Making Test was found to increase with each succeeding decade (Davies, 1968; Lindsey & Coppinger, 1969) - TMT was able to distinguish between individuals with brain damage and normal subjects (Lewinsohn, 1973). However its ability to distinguish between persons with brain injury and psychiatric patients has not been consistent (Heaton, Smith, Lehman & Vogt, 1978) • Predictive: - Lewinsohn (1973) found that performance on Trails A was predictive of vocational rehabilitation following brain injury

Table 6-4 (continued).

Geriatric Depression Scale (GDS) (Sheikh & Yesavage, 1986)	To screen for the presence of depression	• Consists of 15 items	• Self-report tool with respondents answering yes or no to each item • One point is given if the person answers "yes" and 0 points are given if the answer is no • Scores from the 15 items are summed to calculate a total score • Total scores range from 0 – 15 • Higher scores are indicative of more depressive symptomatology	• Test-retest: - A correlation of .85 was obtained between questionnaires completed one week apart by 20 subjects for the 30 item version of the GDS • Internal consistency - Cronbach's alpha = .81 (Almeida & Almeida, 1999)	• Content: - 15 items from the 30 item version of the GDS, that had the highest correlation with depressive symptoms were selected • Criterion: - Comparison of the 30 item and 15 item versions of the GDS, revealed an excellent correlation of r = .84. Both forms of the GDS were successful in differentiating depressed and non-depressed subjects - The GDS was found to have an excellent correlation (r = .82) with the Montgomery-Asberg Rating Scale (Almeida & Almeida, 1999)

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