DISABILITY IN OLDER ADULTS WITH DEPRESSION

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Depression is a leading cause of disability among older adults which can change the scope of daily life for older adults and threaten their ability to live independently in the community. This dissertation explored task disability in older adults with depression in three studies. A unique aspect of the studies was the assessment of disability through performance-testing. The first study examined task disability patterns in a sample of older adults with depression being treated as inpatients (n = 60) or outpatients (n = 59). Rasch analysis revealed that the degree of disability for task domains (functional mobility [FM], basic activities of daily living [BADL], instrumental activities of daily living [IADL] with a greater physical component [IADL–physical], and IADL with a greater cognitive component [IADL–cognitive]), and task items, was different for older women whose depression resulted in inpatient versus outpatient treatment. With the same sample, the second study examined the impact of information processing speed on task disability. The patients were separated into groups by speed of processing (slower patients, n = 76; faster patients, n = 23) based on their performance on the Trail Making Test – B. Speed of processing was associated with severity of depression and both depression and slower speed of processing interfered more with effortful processing tasks (i.e., IADL–cognitive and IADL-physical) and less with tasks requiring automatic processing (i.e. FM). The third study compared physician rated disability on the Global Assessment of Function (GAF) Scale with performance-disability observed on the Performance Assessment of Self-Care Skills (PASS) in a hospitalized community-based sample separated into subgroups by readmission status (readmit patients, n =

15; non-readmit patients, $n = 43$). There was a lack of concordance between the measures with only the GAF Scale showing significant reduction in disability at discharge. Findings from these studies suggest that for older adults with depression, there may be sentinel tasks which are disability indicators and those tasks may differ based on speed of processing. The lack of concordance between the disability measures suggests the need for consideration of performance-based testing of daily life tasks as a component of usual care.

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PREFACE

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1.0 INTRODUCTION

Data from the Global Burden of Disease study indicate that by the year 2020 noncommunicable diseases will be the leading cause of disability and premature death (Murray & Lopez, 1996, 1997). Mental illness is identified as a major noncommunicable disease and is projected to be a leading cause of disability-adjusted life years (DALYs) with an expected increase of 14.7% in DALYs by 2020 (Murray & Lopez, 1996, 1997). This prediction raises significant concern because the burden associated with mental illnesses has been seriously underestimated in conventional epidemiological studies. These studies have accounted only for mortality not disability despite findings as early as 1990 which identified psychiatric conditions as five of the ten leading causes of disability. Hence, for example, in 1990 mental illnesses accounted for over 15 percent of the disease burden in established market economies, such as the United States but were responsible for only slightly greater than 1 percent of deaths (Murray & Lopez, 1996). Today, the percentage of disease burden attributed to mental illness is greater than the disease burden of all malignant diseases and only less than all cardiovascular conditions (National Institute of Mental Health, 2001).

There is a significant financial burden associated with mental illness. In 1996, the United States spent more than $99 billion in direct treatment services for mental illness (National Institute of Mental Health, 2001). Of all mental illnesses, depression is associated with the greatest disease burden and identified as the most costly. In 1990 major depression was the fourth leading cause of disease burden and projections indicate that by 2020 it will advance to the second leading cause (Murray & Lopez, 1996). In the United States, depression costs an

estimated $43 billion per year (Hirschfeld, et al., 1997). Only direct and indirect costs are included in this estimate; the amount does not include the costs associated with pain and suffering and diminished quality of life for these persons and their families.

Changes in the aging population will play a critical role in determining future health needs. Over the last century there has been a notable lengthening of the average life span with a significant increase in the 65 years and older population. This trend is expected to continue with a predicted increase in the older adult population of 71 percent by 2020 (Murray & Lopez, 1997). In this growing older adult population, depression is the most prevalent psychiatric condition (Blazer, 1990; Charney et al., 2003; Murray & Lopez, 1996). As such it represents a serious and costly public health problem because older adults with depression have increased doctor and emergency room visits, increased use of medication, increased outpatient charges, and increased length of stay during hospitalizations (Callahan, Hui, Nienaber, Musick, & Tierney, 1994; Callahan & Wolinsky, 1995; Cooper-Patrick, Crum, & Ford, 1994; Unutzer et al., 1997).

Although research has contributed significantly to understanding the developmental processes associated with aging, new scientific information is required to understand the disability process for older adults, especially how aging with a disability is experienced differently than "normal" aging and the process of recovery. Research has focused on symptom reduction and helped to differentiate mental illness associated impairments such as depressed mood, psychomotor retardation, and cognitive decline from "normal" aging (U.S. Department of Health and Human Services, 1999). However, there has been less investigation addressing the impact that mental illness has on task performance and participation in life roles among the aging population.

Although both older adults and their younger counterparts experience depression, the frequency, associated characteristics, and course of disability may be very different. Additionally, applying the DSM-IV criteria for depression, that is depressed mood most of the day and nearly every day; markedly diminished interest in all, or almost all, activities; significant weight loss; insomnia or hypersomnia; psychomotor agitation or retardation; fatigue or loss of energy; feelings of worthlessness; diminished ability to concentrate; recurrent thoughts of death; and clinically significant disruption in social, occupational, or other important areas of functioning (American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders-IV-text revision, 2000) to the older adult population may be more difficult due to age differences in depressive symptomology (Gallo, Anthony, & Muthen, 1994). Older adults are less likely to report feelings of dysphoria (i.e., sadness, unhappiness, or irritability) and worthlessness, however, they are more likely to report somatic symptoms (Blazer, 1996). Many older adults deny the psychological symptoms of depression due to the stigma associated with mental illness. Additionally, the older adult, family members, and even physicians often inappropriately attribute the signs and symptoms of major depression to "normal aging" or one of many age-associated conditions, such as atherosclerosis or Alzheimer's disease (U.S. Department of Health and Human Services, 1999).

Research suggests that depression is a risk factor for disability and that disability increases the risk of depression (Alexopoulos et al., 1996; Bruce, 1999; Fried & Guralnik, 1997). An estimated 14 to 37 percent of older adults experience significant depressive symptoms (Unutzer et al., 1997; U.S. Department of Health and Human Services, 1999) with 30 to 50 percent of older adults experiencing a period of depression that will negatively influence their activity performance and lead to disability (Dorfman et al., 1995; Guralnik, Fried, Simonsick,

Kasper, & Lafferty, 1995). For some older adults, disability will preclude their ability to live independently in the community.

Numerous studies have described the impairments experienced by older adults with depression. However, there has been less investigation of disability with this population. Moreover, of those studies exploring disability the majority have measured what the older adult with depression does and can do through subjective self-reporting of performance versus objective performance-based testing. Researchers (Berkman et al., 1997; Gallo et al., 2003; Guralnik, Leveille, Hirsch, Ferrucci, & Fried, 1997) have identified the urgent need for more systematic approaches to understand the complexity of and the relationship between disability and depression in older adults. Given that disability due to depression in individuals over 65 years old will become a greater public health problem in the near future there is a need to investigate activity and participation disability in this population and to compare different methods for assessing disability. Investigation is necessary to aid prevention, design interventions, and promote wellness in older adults with depression in an attempt to reduce the staggering burden depression has on the quality of life of millions of older adults as well as the cost of care to their families, communities, and society.

The purpose of this dissertation was to explore task disability in older adults with depression. The specific aims were to:

1) examine task disability patterns in older adults with depression.
2) examine the impact of information processing speed on task disability in older adults with depression.
3) compare methods of measuring disability in older adults with depression.

Chapters 2, 3, and 4 present research studies addressing aims 1, 2, and 3 respectively. In Chapter 5, the results of the three studies are summarized and the implications of these results for future research are discussed.

2.0 TASK DISABILITY OF COMMUNITY-BASED OLDER WOMEN WITH DEPRESSION TREATED AS INPATIENTS OR OUTPATIENTS

2.1 BACKGROUND AND SIGNIFICANCE OF THE PROBLEM

Depression is the most common psychiatric disorder in the older adult population (Blazer, 1990), affecting an estimated 3% to 20% of community-based older adults (Berkman et al., 1986; Blazer, Burchett, Service, & George, 1991; Blazer, Landerman, Hays, Simonsick, & Saunders, 1998; Bruce et al., 2002; Comstock & Helsing, 1976; Eaton & Kessler, 1981; Frerichs, Aneshensel, & Clark, 1981; Huang et al., 2000; Lyness, King, Cox, Yoediono, & Caine, 1999; Murrell, Himmelfarb, & Wright, 1983; Narrow, Rae, Robins, & Regier, 2002). Depressed mood most of the day and nearly every day; markedly diminished interest in all, or almost all, activities; significant weight loss; insomnia or hypersomnia; psychomotor agitation or retardation; fatigue or loss of energy; feelings of worthlessness; diminished ability to concentrate; and recurrent thoughts of death are hallmarks of major depression. Additionally, there is a clinically significant disruption in social or occupational role functioning (American Psychiatric Association, DSM-IV, 1994). Projections indicate that by the year 2020 unipolar major depression will be the second leading cause of disability in the United States, surpassed only by ischemic heart disease (Murray & Lopez, 1997).

Research suggests that depression is a risk factor for disability and that disability increases the risk of depression (Alexopoulos et al., 1996; Bruce, 1999; Fried & Guralnik, 1997). Disability appears to parallel the course of depression with evidence indicating that symptoms of depression are associated with physical impairment and social role dysfunction more than

physical impairment alone (Wells et al., 1989). It is estimated that 30% to 50% of older adults who experience depression will also experience disability (Dorfman et al., 1995). Moreover, the National Institutes of Health Consensus Development Panel on Depression in Late Life (Alexopoulos et al., 1996) identified depression as a disabling factor in older adults who might otherwise be functional members of their communities.

The overall aim of this study was to examine performance disability in patients with major depression. Inpatients and outpatients were included in this study to examine differences in disability risk-factors associated with the need for more or less intensive and costly treatment. Disability was examined in 4 task domains: (1) functional mobility (FM), (2) basic activities of daily living (BADL), and instrumental activities of daily living (IADL), which for the purposes of this study was subdivided into (3) IADL with a greater physical component (IADL–physical) and (4) IADL with a greater cognitive component (IADL–cognitive). A unique aspect of the study was the assessment of disability through performance-testing as opposed to self or proxy report. Rasch analysis was used to create a hierarchy of task difficulty using the Performance Assessment of Self-Care Skills (PASS) (Rogers & Holm, 1989) to describe the relative difficulty of task domains and task items. Identification of the relative level of difficulty of FM, BADL, IADL–physical, and IADL–cognitive task domains and task items could aid in planning evaluations and interventions, and identification of appropriate discharge settings. We hypothesized that: (1) performance disability in FM, BADL, IADL–cognitive, and IADL–physical would be greater in the inpatient sample than in the outpatient sample; (2) performance disability would be greatest in the IADL–cognitive domain, followed by the IADL–physical domain, then BADL domain, and lastly FM domain in both the inpatient and outpatient samples; and (3) the strength of the relationship between impairment and disability in the FM, BADL,

IADL–cognitive, and IADL–physical domains would be stronger in the inpatient sample than the outpatient sample.

2.2 METHODS

2.2.1 Participants

The data analyzed for this study were derived from two methodological studies of functional status assessment. To be included in the analysis, participants had to: (a) have a diagnosis of major depression; (b) be female, at least 60 years of age, and medically stable; (c) report a history of routinely performing targeted tasks and current disability in at least one FM, BADL, or IADL based on the Older Adult Resources and Services (OARS) Multidimensional Functional Assessment ADL questions (Fillenbaum, 1988); and, (d) be community dwelling. For outpatients the psychiatric diagnosis was made by a board certified geriatric psychiatrist; for inpatients it was achieved through consensus of the geriatric psychiatrists on the research unit. The analysis was limited to women because they are the primary homemakers for the current generation of older adults and the majority of IADL tasks typically assessed in geriatrics have usually been performed by women. Exclusion criteria were: (a) coexisting dementia [i.e., Mini-Mental State Examination score $\leq$ 24] (Folstein, Folstein, & McHugh, 1975); and (b) presence of an uncorrected, auditory or visual impairment that impaired the ability to participate in performance testing.

2.2.2 Procedures

Potential participants were referred to the inpatient and outpatient studies with their physicians' approvals. All participants signed informed consent. After approval by the University of

Pittsburgh Institutional Review Board, 60 inpatients and 59 outpatients were recruited from the geriatric psychiatry services of the now, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania. After eligibility requirements were verified, demographic and impairment data were gathered on the first day of testing. Disability assessment was done within 3 days of admission for the inpatients and on the 2nd of 3 days of testing for the outpatients. It was conducted in the occupational therapy clinic by a research associate, trained and supervised by a licensed occupational therapist. Thus, all patients were tested on familiar tasks but in an unfamiliar environment.

2.2.3 Instruments

Performance disability was measured with the PASS–Clinic Version (Rogers & Holm, 1989). The PASS places subjects in 26 situational tasks: 5 FM, 3 BADL, 14 IADL–cognitive, and 4 IADL–physical (see Table 2-1).

Table 2-1 PASS task items

Functional Mobility
Bed transfer (move from prone to supine position and rise from bed)
Stair use (ascend and descend stairs)
Toilet transfer (sit and rise from a toilet)
Bathtub/shower transfer (enter and exit tub and/or shower)
Indoor walking (walk indoors)
Basic Activities of Daily Living
Oral hygiene (clean teeth, dentures and/or mouth)
Trim toenails (groom toenails)
Dress (don and doff upper body and lower body clothing)
Instrumental Activities of Daily Living – cognitive
Shop (select and purchase grocery items)
Pay bills by check (write checks for sample utility bills)
Balance checkbook (balance a checkbook after writing checks)
Mail bills and checks (prepare envelopes for mailing checks)
Telephone use (use telephone to obtain information)
Medication management (read medication information and organize medication according to prescription)
Obtain information: auditory (obtain information from a radio announcement)
Obtain information: visual (obtain information from a newspaper)
Small repairs (repair a flashlight)
Home safety (identify and correct hazards or problems in home safety situations)
Bingo (play bingo)
Oven use (cook muffins in an oven)
Stovetop use (cook soup on a stovetop)
Use sharp utensils (cut an apple with a sharp knife)
Instrumental Activities of Daily Living – physical
Bend, lift, and carry garbage (lift and carry garbage sack)
Change bed linen (put on bed linens)
Sweep (clean spillage on the floor using a broom and a dust pan)
Clean up after meal preparation (perform clean up tasks after meal preparation)

Tasks are presented by the examiner in a standardized manner, which includes the verbal instructions and the placement of task objects. Independence of performance is rated on a 4-point, ordinal scale, with 3 indicating that no assistance was given for task initiation, continuation, or completion and 0 indicating that total assistance was required. Scores are based on the frequency (e.g., occasional or continuous) and type of assistance provided by the examiner during testing (see Table 2.2).

Table 2-2 PASS independence scoring criteria

SCORE	CRITERIA
INDEPENDENT PERFORMANCE	
3	No assists given for task initiation, continuation, or completion
2	No Level 7-9 assists given, but occasional Level 1-6 assists given
1	No Level 9 assists given; occasional Level 7 or 8 assists given, or continuous Level 1-6 assists given
0	Level 9 assists given, or continuous Level 7 or 8 assists given; or unable to initiate, continue, or complete subtasks or task
DEPENDENT PERFORMANCE	

Assistance is provided only when needed, with the least assistive prompt used first followed by progressively more assistive and intrusive prompts. The types of assistance ordered from least to most assistive are: verbal supportive, verbal non-directive, verbal directive, gestures, task/environmental rearrangement, demonstration, physical guidance, physical support, and total assistance (see Table 2-3).

Table 2-3 PASS prompt hierarchy

	LEVEL	PROMPT	DESCRIPTION
LEAST RESTRICTIVE			
VERBAL	1	Verbal support	Encouragement
	2	Verbal non-directive	Cue to alert that something is not right
	3	Verbal directive	Tell person what to do next
GESTURE	4	Gestures	Point at task object
	5	Task/environmental rearrangement	Break task down
	6	Demonstration	Assessor demonstrates/person follows
PHYSICAL	7	Physical guidance	"Hands down" – move body part into place
	8	Physical support	"Hands up" – lift body part/clothes/support
	9	Total assist	Assessor does task or subtasks for the person
MOST RESTRICTIVE			

Scores of 0 through 3 were applied to the subtasks that comprise each of the 26 tasks. Thus, a task rating is the mean of the subtask scores for each item. Inter-rater reliability was established by administering the PASS to 23 older adults, representative of the following populations: well-elderly, depression, osteoarthritis, cardiopulmonary disease, and dementia. For task independence, for the 5 FM items, raters agreed on 507 of 525 observations (percent agreement 97%; average kappa 0.43); for the 3 BADL items raters agreed on 439 of 480 observations (percent agreement 91%; average kappa 0.38); for the 4 IADL–physical items raters agreed on 436 of 462 observations (percent agreement 94%; average kappa 0.43); and for the 14 IADL–cognitive items raters agreed on 1,682 of 1,805 observations (percent agreement 93%;

average kappa 0.29). Clinically, the decision consistency of the raters' observations was excellent. Because the PASS is a criterion-referenced instrument the low probabilistic kappa coefficients are not remarkable (Cicchetti & Feinstein, 1990). Most subjects completed the performance-based disability measure in 1 to 1 ½ hours.

Exploratory factor analysis was used to investigate the unidimensionality of the PASS independence construct. We chose the commonly used approach, Cattell's scree test (Cattell, 1966), which examines the scree plot of the eigenvalues plotted against the factor numbers. The 26-item PASS will theoretically have 26 possible underlying factors. Each factor has an eigenvalue indicating the amount of variation in the items accounted for by each factor. Although there is no definitive limit on the plot, a scree plot is generally interpreted by examining the number of factors before the plotted line levels out or shows an "elbow." Cattell's rule is to drop all components after the one starting the elbow (Dunteman, 1989). Determining where the "elbow" begins is somewhat subjective, however if the points on the plot have a tendency to level out, these eigenvalues are usually considered close enough to zero that they can be ignored. Independence scores for the 26 task items of the PASS for 1158 subjects were examined by factor analysis using SPSS 12.0. Examination of the scree plot revealed a dominance of the first factor. The largest eigenvalue of the correlation matrix for the 26 items was 3.44 times larger than the second largest eigenvalue and accounted for over 37% of the variance. Using Cattell's scree test, examination of the PASS independence data revealed the presence of a dominant construct and therefore the assumption of unidimensionality for the Rasch model was met (Hambleton, Swaminathan, & Rogers, 1991, pp.9-10).

Medical burden was measured on the Cumulative Illness Rating Scale for Geriatrics (CIRS–G) (Miller & Towers, 1991; Miller et al., 1992). Affective and physical impairment were

measured with the Geriatric Depression Scale – 15 item version (GDS) (Yesavage et al., 1982-1983) and Keitel Functional Test (KFT) (Eberl, Fasching, Rahlfs, Schleyer, & Wolf, 1976), respectively. The measures of cognitive impairment were the Modified Mini-Mental State (3MS) Examination (Teng & Chui, 1987) and Trail Making Test – A and B (TMT–A; TMT–B) (Lezak, 1983; Reitan, 1958). Perceived general health status on the day of testing was measured on a visual analogue scale with 0 representing worst and 10 representing best health state imagined.

2.2.4 Data Analysis

Descriptive statistics were calculated using SPSS version 12.0 to describe the sociodemographic, pathology, impairment, and disability data for each sample. Relationships among variables were examined using Pearson correlations. Independent *t*-tests were performed to investigate the magnitude and significance of differences between the inpatient and outpatient groups for level of independence in the 4 task domains and the 26 task items. A Bonferroni adjustment was used due to the repeated intercorrelations and *t*-tests within each task domain.

The level of independence in the 4 task domains and the 26 task items for the inpatients and the outpatients was examined by Rasch Item Response Theory (IRT) or Rasch analysis using Winsteps version 3.55. Rasch analysis was used to transform the ordinal scale scores of the PASS into interval measures on a logarithmic scale. The transformations estimate the difficulty of the item and the ability of the person along a hierarchical "more than/less than" line of inquiry. The interval sizes are determined by the actual item and person performance probabilities detected in the data. Hierarchies of task difficulty and person ability are established using the measure on the interval or logit (log odds unit) scale. Therefore the unit intervals

between locations on the item or person logit scale have a consistent value or meaning. This log transformation allows for comparison of the relative difficulty of tasks to other tasks, and for comparison of the relative ability of a person to other persons. This study used a score of zero as the midpoint of difficulty or ability. Items with more positive logit values were harder to perform while those with a more negative value were easier to perform. In contrast, persons with more positive logit values had a greater likelihood of performing tasks independently than persons with lower or negative logit values.

In an ideal situation the empirical data would be a perfect fit with the mathematical description of the Rasch model, however the data collected through clinical observation describes performance in the real world so all data deviates from the model to some extent. Item and person performance deviations from the expected model, or the fit statistics, are determined by examining the degree of error associated with each logit. The fit discrepancy is reported as INFIT and OUTFIT. The INFIT and OUTFIT statistics each use a slightly different method for determining the fit of an item or person to the Rasch model. The INFIT statistic is an information-weighted sum which gives more weight to performances of persons closer to the item value to provide more insight into the item's performance. The OUTFIT statistic is not weighted, and therefore is influenced more by outlying scores. That is, INFIT statistics are sensitive to unexpected performance close to the person's ability in contrast to OUTFIT statistics which are sensitive to unexpected performance that is farther away from the person's ability (Fortinsky, Garcia, Sheehan, Madigan, & Tullai-McGuiness, 2003). The INFIT and OUTFIT mean square errors of each item were examined for values ≤ 0.5 or ≥ 1.7 which could indicate a poor fit with the model for clinical observation tests (Linacre & Wright, 1994). For example, an INFIT or OUTFIT value of 1.7 indicates 70% more variation in the observed performance than

the Rasch model predicts (Bond & Fox, 2001). An item is identified as problematic when both INFIT and OUTFIT values deviate from the model. A problematic item requires further investigation to determine if recoding is required due to unexpected observed performance or small sample sizes, or to determine if the item should to be combined with another item, removed, or left as is. The analysis of fit is essential if the interpretation of the Rasch measures is to be useful (Smith, 1998, 2000; Smith, Schumacker, & Busch, 1998; Smith & Suh, 2003).

PASS independence data for the inpatients and outpatients were analysed together, thus placing all data on a common metric. The raw independence scores for all subtasks (n = 161 per group) of the 26 PASS task items were included in the Rasch analysis. In doing so, a logit value was obtained for each subtask. An average task item logit value was obtained by calculating the mean of the subtask logit values. The same process was used to calculate the INFIT and OUTFIT statistics for each task item, that is the mean of the subtask INFIT values and OUTFIT values. Table 2-4 provides an example of the calculations. Task domain average logit, INFIT, and OUTFIT values were obtained by calculating the mean of respective values for the task items within the domain (i.e., FM, BADL, IADL–cognitive, and IADL–physical).

Table 2-4 Calculation of the average logit, INFIT and OUTFIT values for the IADL–cognitive shop task for the inpatients

Logit	INFIT	OUTFIT	Subtask #	Shop Subtask
0.45	1.26	2.10	1	Selects all 4 items on the shopping list correctly
-0.15	1.31	1.66	2	Selects the correct cash (matches receipt amount)
0.05	1.79	1.96	3	Selects the correct coupon for the matching item
0.50	1.37	2.38	4	Reaches for and gathers toilet paper
1.03	1.09	2.25	5	Places toilet paper
0.38	1.36	2.07	Average values for Shop Task Item	

2.3 RESULTS

2.3.1 Participant characteristics

The typical inpatient was 74 years old whereas the average outpatient was 76 years old. Both samples were primarily widowed, Caucasian, females with a minimum of a high school education and living alone but spending at least 8 hours per day with another person (see Table 2-5). Medical burden (CIRS–G) of the inpatients and outpatients was low to moderate. However, on the impairment measures, inpatients evidenced significantly greater depressive symptomatology (GDS), cognitive impairment (3MS; TMT–A; TMT–B), and physical impairment (KFT), and perceived a lower general health status.

Table 2-5 Characteristics and differences between the inpatients and outpatients

	Inpatients (n = 60)	Outpatients (n = 59)		Significance
	M (CI)	M (CI)	t, FET[a]	p
Sociodemographic variables				
Age, years	73.77 (72.00, 75.53)	75.73 (74.67, 76.79)	-1.91	.060
Race % Caucasian	93.30	81.40	3.87[a]	.058
Education % ≥ high school graduate	58.40	81.50	7.47[a]	.009
Marital status % widowed	63.30	62.70	0.14[a]	1.000
Living status % lives alone	50.00	62.70	1.95[a]	.197
Supervision % > 8 hours spent with another person	38.30	28.80	1.21[a]	.333
Pathology and impairment variables				
CIRS–G Scores range 0 to 56	11.00 (10.14, 11.86)	11.02 (10.17, 11.86)	-0.29	.977
GDS Scores range 0 to 15	8.11 (7.06, 9.16)	4.00 (3.02, 4.98)	5.75	.01**
3MS Scores range 0 to 100	87.52 (85.16, 89.88)	93.10 (91.77, 94.44)	-4.13	.01**
TMT–A Scores in seconds	97.28 (74.39, 120.17)	54.54 (47.81, 57.28)	3.85	.01**
TMT–B Scores in seconds	233.61 (192.50, 274.73)	149.11 (126.21, 172.01)	3.62	.01**
KFT Scores range 4 to 100	31.15 (25.67, 36.63)	21.49 (19.27, 23.71)	3.27	.05*
Perceived health status Scores range 0 to 10	4.27 (3.45, 5.09)	7.39 (6.91, 7.87)	-6.74	.01**

Note. CIRS–G = Cumulative Illness Rating Scale for Geriatrics; GDS = Geriatric Depression Scale; 3MS = Modified Mini-Mental State; TMT–A = Trail Making Test – A; TMT–B = Trail Making Test – B; KFT = Keitel Functional Test.

> impairment = higher scores (CIRS–G; GDS; TMT–A; TMT–B; KFT); > impairment = lower scores (3MS; perceived health status).

FET[a] = Fishers exact test for Pearson Chi-Square.

*$p \leq 0.007$ before Bonferroni adjustment. **$p \leq 0.001$ before Bonferroni adjustment.

2.3.2 Disability

2.3.2.1 Factors related to disability

In the inpatients, age was not significantly correlated with any of the task domains (see Table 2-6). Similarly, in the outpatients, age was not significantly correlated with the FM, BADL, and IADL–cognitive domains, however dissimilar to the inpatients, age was significantly correlated with the IADL–physical domain (r = -0.51), indicating that as the ages of the outpatients increased, their independence in performance of IADL tasks with a greater physical component decreased (i.e., lower PASS score).

Table 2-6 Relationships among demographic, and pathology and impairment variables

	Inpatients (n = 60)				Outpatients (n = 59)			
Factors	PASS Task Domains				PASS Task Domains			
	FM	BADL	IADL–C	IADL–P	FM	BADL	IADL–C	IADL–P
Demographic variable								
Age	-0.06	-0.15	-0.24	-0.09	-0.30	-0.14	-0.23	-0.51**
Pathology and impairment variables								
CIRS–G	-0.17	-0.04	-0.11	-0.09	-0.09	-0.31	-0.22	-0.07
GDS	-0.26	-0.10	-0.24	-0.25	-0.20	-0.40*	-0.14	-0.13
3MS	0.06	0.12	0.31	0.16	-0.15	-0.02	0.40*	0.07
TMT–A	0.01	-0.17	-0.02	0.02	0.02	-0.27	-0.44*	-0.19
TMT–B	-0.08	-0.29	-0.01	-0.03	-0.01	-0.33	-0.49**	-0.09
KFT	-0.63**	-0.52**	-0.39*	-0.48**	-0.24	-0.44**	-0.27	-0.38*

Note. FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical; CIRS–G = Cumulative Illness Rating Scale for Geriatrics; GDS = Geriatric Depression Scale; 3MS = Modified Mini-Mental State; TMT–A = Trail Making Test – A; TMT–B = Trail Making Test – B; KFT = Keitel Functional Test.
*Correlation is significant at the .05 level (2-tailed) with Bonferroni adjustment. **Correlation is significant at the .01 level (2-tailed) with Bonferroni adjustment.

The impairment variable of most interest was movement capability, as measured on the KFT, which was significantly correlated with all functional domains in both groups, except for FM and IADL-cognitive in the outpatients. The strength of the relationships ranged from r = -0.24 to -0.63, suggesting that as physical impairment increased (i.e., higher KFT scores), independence decreased (i.e., lower PASS scores). Furthermore, the relationships were consistently stronger in the inpatient group. All other significant correlations were in the

outpatient group. The 3MS, TMT–A, and TMT–B, measures of cognitive impairment, yielded significant correlations but only with the IADL–cognitive domain. As the outpatients' cognitive impairment increased (i.e., lower 3MS scores), their independence in performance of IADL tasks with a greater cognitive component decreased (i.e., lower PASS score). Additionally, as visual search and sequencing abilities, and information processing speed deteriorated (i.e., higher TMT–A & B scores) disability emerged in the IADL–cognitive domain. The relationship between the GDS score and the BADL domain in the outpatients was moderate (r = -0.40), indicating that as symptoms of depression increased (i.e., higher GDS score), so did disability (i.e., lower PASS score) in BADL tasks (i.e., clean teeth, dentures and/or mouth; groom toenails; don and doff upper body and lower both clothing).

For the inpatients, there were significant correlations among all domains with the strength of the relationships ranging from r = 0.51 to 0.76 (see Table 2-7). The correlation between the two IADL domains and the IADL–physical and FM domains were the strongest (r = 0.76). For the outpatients, the only significant correlation was between FM and IADL–physical domains and the strength of this relationship (r = 0.43) was less than the strength of all relationships for the outpatients.

Table 2-7 Relationships among disability variables in the inpatients and outpatients

	Inpatients (n = 60)				Outpatients (n = 59)			
Factors	PASS Task Domains				PASS Task Domains			
	FM	BADL	IADL–C	IADL–P	FM	BADL	IADL–C	IADL–P
Disability variables								
FM	1.00				1.00			
BADL	0.57**	1.00			0.20	1.00		
IADL–C	0.51**	0.55**	1.00		0.25	0.29	1.00	
IADL–P	0.76**	0.52**	0.76**	1.00	0.43**	0.32	0.33	1.00

Note. FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical.
**Correlation is significant at the .01 level (2-tailed) with Bonferroni adjustment.

2.3.2.2 Task domains

Task performance of the outpatients was significantly ($p \leq .01$) more independent than that of the inpatients in all 4 task domains (see Table 2-8). For the inpatients, tasks in the FM domain were performed with the greatest independence, followed by the BADL, IADL–physical, and IADL–cognitive domains. Similarly, the outpatients evidenced the greatest independence in FM and the least in the IADL–cognitive domain, however, greater independence was seen in the IADL–physical domain than in BADL. As might be expected, there was the greatest disparity (see t value) between the groups for the more complex IADL–cognitive domain, followed by the IADL–physical, BADL, and FM domains. Moreover, the domain of greatest independence for the inpatients (FM, M = 2.43) was less than the domain of greatest dependence (IADL–cognitive, M = 2.48) for the outpatients.

Table 2-8 Differences between inpatients and outpatients for task domains, ranked by *t* value

	Inpatients (n = 60)	Outpatients (n = 59)	*t*-test	Significance
	M (CI)	*M* (CI)	*t*	*p*
PASS Task Domain				
IADL–C	1.83 (1.66, 2.01)	2.43 (2.39, 2.49)	-6.59	.01**
IADL–P	1.88 (1.63, 2.12)	2.63 (2.54, 2.71)	-5.80	.01**
BADL	2.04 (1.88, 2.21)	2.58 (2.47, 2.69)	-5.36	.01**
FM	2.40 (2.21, 2.59)	2.75 (2.70, 2.81)	-3.57	.01**

Note. FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living – cognitive; IADL–P = Instrumental Activities of Daily Living – physical; > disability = lower scores
**$p \leq .003$ before Bonferroni adjustment.

2.3.2.3 Task items

Although the task domains of greatest independence (FM) and greatest dependence (IADL–cognitive) were ranked identically for the inpatients and outpatients, the individual task items of greatest independence and dependence were different for each group (see Table 2-9). The inpatients ascended and descended the stairs with the greatest independence (stair use, FM, M = 2.55) and balanced the checkbook with the greatest dependence (balance checkbook, IADL–cognitive, M = 1.37), whereas the outpatient group walked indoors with the greatest independence (indoor walking, FM, M = 2.98) and shopped with the greatest dependence (shop, IADL–cognitive, M = 2.07).

Table 2-9 Differences between inpatients and outpatients for task items, ranked by *t* value

	Inpatients (n = 60)	Outpatients (n = 59)	t-test	Significance
	M (CI)	M (CI)	t	p
PASS Task Item				
Clean up after meal preparation (IADL–P)	1.60 (1.29, 1.91)	2.66 (2.54, 2.79)	-6.32	.01**
Oven use (IADL–C)	1.53 (1.25, 1.81)	2.49 (2.36, 2.62)	-6.20	.01**
Balance checkbook (IADL–C)	1.37 (1.09, 1.64)	2.24 (2.13, 2.35)	-5.83	.01**
Pay bills by check (IADL–C)	1.58 (1.33, 1.83)	2.37 (2.24, 2.50)	-5.66	.01**
Stovetop use (IADL–C)	1.56 (1.29, 1.83)	2.41 (2.28, 2.54)	-5.66	.01**
Trim toenails (BADL)	1.39 (1.07, 1.71)	2.44 (2.21, 2.67)	-5.34	.01**
Change bed linen (IADL–P)	1.48 (1.17, 1.80)	2.31 (2.14, 2.47)	-4.63	.01**
Bingo (IADL–C)	2.19 (1.91, 2.47)	2.85 (2.74, 2.95)	-4.42	.01**
Mail bills and checks (IADL–C)	1.58 (1.33, 1.83)	2.17 (2.01, 2.27)	-4.39	.01**
Use sharp utensils (IADL–C)	1.71 (1.38, 2.03)	2.46 (2.33, 2.59)	-4.31	.01**
Bend, lift, and carry garbage (IADL–P)	1.97 (1.67, 2.26)	2.64 (2.52, 2.77)	-4.25	.01**
Obtain information: visual (IADL–C)	2.20 (1.90, 2.50)	2.85 (2.75, 2.94)	-4.12	.01**
Telephone use (IADL–C)	1.97 (1.74, 2.19)	2.51 (2.37, 2.65)	-4.05	.01**
Home safety (IADL–C)	1.91 (1.73, 2.10)	2.37 (2.25, 2.50)	-4.02	.01**
Sweep (IADL–P)	2.37 (2.09, 2.65)	2.90 (2.82, 2.98)	-3.64	.05*
Shop (IADL–C)	1.80 (1.67, 1.93)	2.07 (2.00, 2.13)	-3.61	.05*
Small repairs (IADL–C)	1.86 (1.63, 2.10)	2.32 (2.20, 2.44)	-3.41	.05*

Table 2-9 (continued)

Indoor walking (FM)	2.53 (2.27, 2.80)	2.98 (2.95, 3.01)	-3.35	.05*
Bathtub/shower transfer (FM)	1.85 (1.58, 2.12)	2.36 (2.20, 2.51)	-3.25	.05*
Stair use (FM)	2.55 (2.30, 2.80)	2.95 (2.89, 3.01)	-3.12	.003
Medication management (IADL–C)	1.93 (1.75, 2.12)	2.22 (2.11, 2.33)	-2.69	.008
Dress (BADL)	2.23 (2.02, 2.45)	2.54 (2.41, 2.67)	-2.46	.016
Obtain information: auditory (IADL–C)	2.42 (2.18, 2.65)	2.75 (2.61, 2.88)	-2.44	.016
Oral hygiene (BADL)	2.48 (2.30, 2.66)	2.75 (2.60, 2.89)	-2.28	.024
Bed transfer (FM)	2.52 (2.31, 2.73)	2.76 (2.65, 2.87)	-2.07	.041
Toilet transfer (FM)	2.53 (2.34, 2.72)	2.71 (2.59, 2.83)	-1.58	.118

Note. FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical; > disability = lower scores
*$p \leq .002$ after Bonferroni adjustment. **$p \leq .000$ after Bonferroni adjustment.

The majority (61.54%) of mean performance scores for the inpatients were at a performance level that required substantive assistance (i.e., score < 2.00) (see Table 2-9) (see Table 2-2 for PASS independence scoring criteria). Specifically, assistance was required in the form of: (a) occasional physical support or physical guidance, or (b) continuous demonstration, rearrangement of task or environment, gestures, verbal directives, verbal non-directives, and/or verbal encouragement (see Table 2-3 for PASS prompt hierarchy). In contrast, 100% of the mean performance scores of individual task items for the outpatients fell at a functional level (i.e., score ≥ 2.00) indicating that participants required: occasional demonstration, rearrangement of task or environment, gestures, verbal directives, verbal non-directives, and/or verbal

encouragement. Only 38.46% of the mean performance scores for the inpatient group fell at this level.

The outpatients performed significantly better ($p \leq .05$ or .01) than the inpatients on 19 of the 26 individual task items (see Table 2-9). Although the outpatients performed more independently than the inpatients for all tasks, the performance between the 2 groups was not statistically different for two IADL–cognitive tasks (medication management and obtaining auditory information), two BADL tasks (dressing and oral hygiene), and three FM tasks (stair use and bed and toilet transfers).

2.3.2.4 Fitting PASS data to the Rasch model

Tables 2-10 and 2-11 summarize the INFIT and OUTFIT statistics for the 4 PASS task domains and the 26 task items for the inpatients and outpatients. As previously stated, items with both INFIT and OUTFIT mean square values of ≤ 0.5 or ≥ 1.7 are considered problematic for clinical observation tests (Bond & Fox, 2001). The goodness-of-fit statistics for task domains indicated that all task domains demonstrated acceptable goodness-of-fit to the model (see Table 2-10). Although several task items (see Table 2-11) have fit statistic values ≥ 1.7 only the toilet transfer task item within the FM domain for the outpatient group had both INFIT and OUTFIT mean square values greater than the suggested level, indicating the need to inspect this item for problematic subtasks.

Table 2-10 Rasch measures of difficulty by PASS task domains for inpatients and outpatients

Average Logit	Average INFIT MNSQ	Average OUTFIT MNSQ	Task Domain
HARDEST			**HARDEST**
0.53	1.01	0.88	**IADL–P**
0.44	1.12	1.22	**IADL–C**
0.00 MEAN			
-0.11	1.31	1.97	**BADL**
-0.30	1.39	1.19	**FM**
-0.38	0.85	0.87	*IADL–C*
-0.39	1.55	0.99	*BADL*
-0.74	1.01	0.76	*IADL–P*
-1.64	1.26	1.19	*FM*
EASIEST			**EASIEST**

Note. Inpatient = **Bold**; Outpatient = *Italics*; FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical.

Table 2-11 Rasch measures of difficulty by PASS task items for inpatients and outpatients

Average Logit	Average INFIT MNSQ	Average OUTFIT MNSQ	PASS Task Domain	PASS Task Item
HARDEST			**HARDEST**	**HARDEST**
1.13	0.83	0.70	**IADL–C**	**Balance a checkbook**
1.12	1.11	1.31	**BADL**	**Trim toenails**
1.03	1.09	1.08	**IADL–P**	**Change bed linen**
0.95	0.66	0.52	**IADL–C**	**Oven use**
0.85	0.82	0.57	**IADL–C**	**Use sharp utensils**
0.81	0.90	0.70	**IADL–P**	**Clean up after meal preparation**
0.79	0.96	0.76	**IADL–C**	**Stovetop use**
0.74	0.84	0.79	**IADL–C**	**Mail bills and checks**
0.69	0.53	0.67	*IADL–C*	*Shop*
0.65	0.87	0.69	**IADL–C**	**Pay bills by check**
0.63	1.31	0.94	*BADL*	*Trim toenails*
0.57	1.62	2.05	**FM**	**Bathtub/shower transfer**
0.51	0.88	0.90	**IADL–C**	**Small repairs**
0.38	1.36	2.07	**IADL–C**	**Shop**
0.35	1.50	0.98	*FM*	*Bathtub/shower transfer*
0.32	1.40	0.94	*IADL–P*	*Change bed linen*
0.29	1.03	0.83	**IADL–P**	**Bend, lift and carry garbage**
0.28	1.64	2.20	**IADL–C**	**Obtain information: visual**
0.28	0.69	0.83	*IADL–C*	*Small repairs*
0.12	0.64	0.85	*IADL–C*	*Use sharp utensils*
0.09	1.55	1.44	**IADL–C**	**Bingo**
0.09	0.66	0.82	*IADL–C*	*Mail bills and checks*
0.02	0.67	0.71	*IADL–C*	*Balance a checkbook*
0.00 MEAN				

Table 2-11 (continued)

-0.01	1.27	1.37	**IADL–C**	**Telephone use**
-0.02	1.00	0.90	**IADL–P**	**Sweep**
-0.03	1.34	1.51	**IADL–C**	**Medication management**
-0.06	1.02	1.03	**IADL–C**	**Home safety**
-0.16	1.59	2.55	**IADL–C**	**Obtain information: auditory**
-0.31	0.80	0.72	*IADL–C*	*Oven use*
-0.32	1.18	1.38	**BADL**	**Dress**
-0.32	0.90	0.43	**FM**	**Indoor walking**
-0.36	2.06	1.16	*BADL*	*Oral hygiene*
-0.40	1.57	1.25	**FM**	**Stair use**
-0.45	1.08	1.26	*IADL–C*	*Obtain information: auditory*
-0.49	0.83	0.86	*IADL–C*	*Medication management*
-0.53	1.25	0.99	**FM**	**Bed transfer**
-0.57	0.88	0.64	*IADL–P*	*Clean up after meal preparation*
-0.58	1.05	0.69	*IADL–C*	*Bingo*
-0.73	1.43	1.25	*IADL–C*	*Telephone use*
-0.80	0.84	0.86	*IADL–C*	*Obtain information: visual*
-0.81	1.62	1.22	**FM**	**Toilet transfer**
-0.85	0.87	0.75	*IADL–P*	*Sweep*
-0.93	1.03	0.99	*IADL–C*	*Stovetop use*
-1.06	0.78	0.83	*IADL–C*	*Pay bills by check*
-1.13	0.81	0.84	*IADL–C*	*Home safety*
-1.14	1.65	3.21	**BADL**	**Oral hygiene**
-1.44	1.29	0.88	*BADL*	*Dress*
-1.45	1.80	2.13	*FM*	*Toilet transfer*
-1.87	0.89	0.72	*IADL–P*	*Bend, lift and carry garbage*
-1.95	1.00	0.93	*FM*	*Bed transfer*
-2.25	0.99	1.03	*FM*	*Stair use*
-2.89	0.99	0.88	*FM*	*Indoor walking*
EASIEST			**EASIEST**	**EASIEST**

Note. Inpatient = **Bold**; Outpatient = *Italics*; FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical. Double vertical lines indicate task items at comparable levels of difficulty within groups.

2.3.2.5 Inspection of PASS toilet transfer task item for the outpatients

Table 2-12 shows the INFIT and OUTFIT mean square error statistics for the outpatients for the 6 subtasks of the toilet transfer task item. The INFIT and OUTFIT mean square error values for subtasks #2 and #3 exceeded 1.7, indicating an unexpected response pattern at those subtasks (Bond & Fox, 2001). To determine if recoding, combining, or removal of items was indicated, the data for outpatients for subtasks #2 and #3 were examined and frequency statistics were calculated. For both subtasks 58 of the 59 outpatients scored 3, representing independent performance of the subtask. Only 1 outpatient scored 0 for subtask #2 and #3, representing complete dependence (i.e., the need for total assistance to perform the subtask). Additionally, the INFIT and OUTFIT mean square error values for subtasks #1 and #6 reflect extreme scores (i.e., MIN = minimum estimated measure). For both subtasks all outpatients (n = 59) scored 3, representing independent performance of the subtasks. Although the model may not anticipate these responses, in clinical practice performance can reflect extreme scores (i.e., total independence or total dependence). Due to the individuality of patients, clinicians know that performance can reflect any point of the continuum from disability to ability including the extremes of performance – complete independence or complete dependence. Additionally, these specific subtasks (i.e., locates bathroom; turns to position self in front of toilet; lowers self onto toilet; and raises self from toilet) reflect movement-related body functions that are well-integrated in the performance of routine daily tasks, such as toileting. They reflect automatic performance of a FM task and performance of these subtasks seems to be less affected by impairments associated with major depression. Therefore, in "real world" performance of community-based older adults we anticipate a high frequency of independent scores or extremes of scores in the subtasks of a FM task. A large OUTFIT mean square error can be triggered

when there are little to no responses in score categories (e.g., 1 patient with a score of 0; no patients with a score of 1 or 2) which results in insufficient observations for the values to be accurately estimated (Fortinsky et al., 2003). Bond and Fox (2001) recommend combining low response categories with adjacent categories where logically or clinically relevant. J. C. Rogers and M. B. Holm (personal communication, May 17, 2005), authors of the PASS (1989) recommended that the subtasks not be combined as each reflects discrete criteria which requires or emphasizes different body functions or a combination of different degrees of body functions.

Table 2-12 Analysis of subtask responses for the PASS toilet transfer task item for outpatients

INFIT MNSQ	OUTFIT MNSQ	Subtask #	Toilet Transfer Subtask
MIN	MIN	1	Locates bathroom
2.89	3.27	2	Turns to position self in front of toilet
2.90	3.61	3	Lowers self onto toilet
0.74	0.83	4	Reaches for and gathers toilet paper
0.67	0.79	5	Places toilet paper
MIN	MIN	6	Raises self from toilet

Note. MIN = minimum estimated measure.

2.3.2.6 Summary of results across task domains

The value of equating using the Rasch model is the placement of all items on the same ability metric which allows for comparison of the relative difficulty of tasks to other tasks. Table 2-10 displays the average values or logits of the task domains for the inpatients and outpatients. The task domains are ordered starting with the hardest task domain to the easiest task domain. The

IADL–physical task domain was the hardest for the inpatients, followed by IADL–cognitive, BADL, and finally FM. For the outpatients the IADL–cognitive task domain was the hardest, followed by BADL, IADL–physical, and FM. Performance of all the task domains was more difficult for the inpatients than the outpatients.

2.3.2.7 Summary of results within task domains

Examination of results within task domains provides information for measuring specific function. It is also useful for assessing the extent to which each task domain is stretched within the hierarchy. The hardest task item within the FM domain for both inpatients and outpatients was the bathtub/shower transfer (enter and exit tub and/or shower) task (see Table 2-13). The remaining FM tasks were ordered in reverse positions for the inpatients and outpatients. That is, for inpatients indoor walking (walk indoors) was the second most difficult task and toilet transfer (sit and rise from a toilet) was the easiest task, whereas toilet transfer was the second most difficult task and indoor walking was the easiest task for the outpatients. Stair use (ascends and descends stairs) and bed transfer (move from prone to supine position and rise from bed) also had reversed positions between the groups.

Table 2-13 Rasch measures of difficulty for FM task items for inpatients and outpatients

HARDEST		**HARDEST**	
Inpatient (n = 60)		Outpatient (n = 59)	
Average Logit	PASS Task Item	Average Logit	PASS Task Item
0.57	**Bathtub/shower transfer**	0.35	*Bathtub/shower transfer*
-0.32	**Indoor walking**	-1.45	*Toilet transfer*
-0.40	**Stair use**	-1.95	*Bed transfer*
-0.53	**Bed transfer**	-2.25	*Stair use*
-0.81	**Toilet transfer**	-2.89	*Indoor walking*
EASIEST		**EASIEST**	

Note. Inpatient = **Bold**; Outpatient = *Italics*; FM = Functional Mobility.

For both the inpatients and the outpatients the hardest task within the BADL domain was trim toenails (groom toenails) (see Table 2-14). Similar to the FM tasks, the remaining two BADL tasks (dress and oral hygiene) were ordered in reverse positions for the inpatients and outpatients. Oral hygiene (cleaning teeth, dentures and/or mouth) was the easiest BADL task for the inpatients whereas dress (dons and doffs upper body and lower body clothing) was the easiest task for the outpatients.

Table 2-14 Rasch measures of difficulty for BADL task items for inpatients and outpatients

HARDEST		**HARDEST**	
Inpatient (n = 60)		Outpatient (n = 59)	
Average Logit	PASS Task Item	Average Logit	PASS Task Item
1.12	**Trim toenails**	0.63	*Trim toenails*
-0.32	**Dress**	-0.36	*Oral hygiene*
-1.14	**Oral hygiene**	-1.44	*Dress*
EASIEST		**EASIEST**	

Note. Inpatient = **Bold**; Outpatient = *Italics*; BADL = Basic Activities of Daily Living.

Of the 14 tasks within the IADL–cognitive domain, only use sharp utensil (cutting an apple with a sharp knife) was ordered the same for both the inpatients and outpatients (see Table 2-15). Although the remaining 13 IADL–cognitive tasks were ordered differently for the inpatients than the outpatients over 70% of the tasks that were either hardest or easiest for the inpatients were similarly hardest or easiest for the outpatients. There were two tasks (stovetop use and pay bills by check) that were among the harder tasks for the inpatients but were among the easier tasks for the outpatients. Similarly there were two tasks (shop and obtain information: auditory) that were among the harder tasks for the outpatients but were among the easier tasks for the inpatients. The hardest IADL–cognitive task for the inpatients was balance a checkbook (balance a checkbook after writing checks) and the easiest task for them was obtain information: auditory (obtain information from a radio announcement). In contrast the hardest IADL–cognitive task for the outpatients was shop (selects and purchases grocery items) and the easiest

task for them was home safety (identifies and corrects hazards or problems in home safety situations).

Table 2-15 Rasch measures of difficulty for IADL–cognitive task items for inpatients and outpatients

HARDEST		**HARDEST**	
Inpatient (*n* = 60)		Outpatient (*n* = 59)	
Average Logit	PASS Task Item	Average Logit	PASS Task Item
1.13	**Balance a checkbook**	0.69	*Shop*
0.95	**Oven use**	0.28	*Small repairs*
0.85	**Use sharp utensils**	0.12	*Use sharp utensils*
0.79	**Stovetop use**	0.09	*Mail bills and checks*
0.74	**Mail bills and checks**	0.02	*Balance a checkbook*
0.65	**Pay bills by check**	-0.31	*Oven use*
0.51	**Small repairs**	-0.45	*Obtain information: auditory*
0.38	**Shop**	-0.49	*Medication management*
0.28	**Obtain information: visual**	-0.58	*Bingo*
0.09	**Bingo**	-0.73	*Telephone use*
-0.01	**Telephone use**	-0.80	*Obtain information: visual*
-0.03	**Medication management**	-0.93	*Stovetop use*
-0.06	**Home safety**	-1.06	*Pay bills by check*
-0.16	**Obtain information: auditory**	-1.13	*Home safety*
EASIEST		**EASIEST**	

Note. Inpatient = **Bold**; Outpatient = *Italics*; IADL–C = Instrumental Activities of Daily Living–cognitive. Double line = median.

The hardest task item within the IADL–physical domain for both inpatients and outpatients was the change bed linen (put on bed linens) task followed by the clean up after meal

preparation (perform clean up tasks after meal preparation) which was the second hardest task for both groups (see Table 2-16). The bend, lift and carry garbage (lift and carry garbage sack) task and the sweep (clean spillage on the floor using a broom and a dust pan) were easy tasks for both the inpatients and outpatients, however the sweep task was easiest for the inpatients whereas the bend, lift and carry garbage tasks was easiest for the outpatients.

Table 2-16 Rasch measures of difficulty for IADL–physical task items for inpatients and outpatients

HARDEST		**HARDEST**	
Inpatient (n = 60)		Outpatient (n = 59)	
Average Logit	PASS Task Item	Average Logit	PASS Task Item
1.03	**Change bed linen**	0.32	*Change bed linen*
0.81	**Clean up after meal preparation**	-0.57	*Clean up after meal preparation*
0.29	**Bend, lift and carry garbage**	-0.85	*Sweep*
-0.02	**Sweep**	-1.87	*Bend, lift and carry garbage*
EASIEST		**EASIEST**	

Note. Inpatient = **Bold**; Outpatient = *Italics*; IADL–P = Instrumental Activities of Daily Living–physical.

2.3.2.8 Summary of results across task items

The logit values of the task items for the inpatients and outpatients are ordered in Table 2-11 starting with the hardest task item and ending with the easiest task item. Overlap of task items or the same logit value for task items occurred only twice. For the inpatients the IADL–cognitive task of obtaining information from a newspaper (obtain information: visual; average logit = 0.28) was as difficult as the IADL–cognitive task of repairing a flashlight (small repairs; average logit

= 0.28) for the outpatients; and for the inpatients the BADL task of donning and doffing upper body and lower body clothing (dress; average logit = -0.32) was as easy as the FM task of walk indoors (indoor walking; average logit = -0.32).

The task items for the inpatients stratified into 17 separate levels (see Table 2-11), with the following task items at comparable levels of difficulty: balance a checkbook and trim toenails; use sharp utensils and clean up after meal preparation; stovetop use and mail bills and checks; bathtub/shower transfer and small repairs; bend, lift and carry garbage and obtain information: visual; telephone use, sweep, medication management, and home safety; and dress and indoor walking. Likewise the task items for the outpatients stratified into 19 separate levels (see Table 2-11), with the following task items at similar levels of difficulty: bathtub/shower transfer and change bed linen; mail bills and checks and balance a checkbook; oven use and oral hygiene; obtain information: auditory and medication management; clean up after meal preparation and bingo; obtain information: visual and sweep; dress and toilet transfer.

For the inpatients, balancing a checkbook (IADL–cognitive) was the hardest task item and oral hygiene (BADL) was the easiest task item (see Tables 2-17 and 2-18). In contrast, for the outpatients shop (IADL–cognitive) was the hardest task item and indoor walking (FM) was the easiest task item. For the inpatients, the hardest tasks to perform (i.e., task items above the mean) were 10 IADL–cognitive tasks (balance a checkbook; oven use; use sharp utensils; stovetop use; mail bills and checks; pay bills by check; small repairs; shop; obtain information: visual; and bingo); 3 IADL–physical tasks (change bed linens; clean up after meal preparation; and bend, lift and carry garbage); 1 BADL task (trim toenails); and 1 FM task (bathtub/shower transfer). The easiest tasks for the inpatients to perform (i.e., task items below the mean) were 4 IADL–cognitive tasks (telephone use; medication management; home safety; and obtain

information: auditory); 1 IADL–physical task (sweep); 2 BADL tasks (dress and oral hygiene); and 4 FM tasks (indoor walking; stair use; bed transfer; and toilet transfer). For the outpatients, the hardest tasks to perform were 5 IADL–cognitive tasks (shop; small repairs; use sharp utensils; mail bills and checks; and balance a checkbook); 1 IADL–physical task (change bed linens); 1 BADL task (trim toenails); and 1 FM task (bathtub/shower transfer). The easiest tasks for the outpatients to perform were 9 IADL–cognitive tasks (oven use; obtain information: auditory; medication management; bingo; telephone use; obtain information: visual; stovetop use; pay bills by check; and home safety); 3 IADL–physical tasks (clean up after meal preparation; sweep; and bend, lift and carry garbage); 2 BADL tasks (oral hygiene and dress); and 4 FM tasks (toilet transfer; bed transfer; stair use; and indoor walking). All the IADL–cognitive and IADL–physical tasks that were easier for the inpatients to perform were still harder than their easier BADL and FM tasks. This arrangement also occurred in the task item hierarchy for the outpatients with the exception of oral hygiene (BADL) which was harder for them to perform and the bend, lift, and carry garbage task (IADL–physical) which was easier for the outpatients to perform than the dress (BADL) and toilet transfer (FM) tasks. For the inpatients, approximately 58% or 15 of the 26 task items were positioned toward the difficult or hard end of the hierarchy, whereas less than 31% or 8 of the 26 task items where similarly positioned for the outpatients.

Table 2-17 Task item hierarchy for inpatients and outpatients

HARDEST	Inpatient (n = 60)	**HARDEST**	Outpatient (n = 59)
PASS Task Item	PASS Task Domain	PASS Task Item	PASS Task Domain
Balance a checkbook	**IADL–C**	*Shop*	*IADL–C*
Trim toenails	**BADL**	*Trim toenails*	*BADL*
Change bed linens	**IADL–P**	*Bathtub/shower transfer*	*FM*
Oven use	**IADL–C**	*Change bed linens*	*IADL–P*
Use sharp utensils	**IADL–C**	*Small repairs*	*IADL–C*
Clean up after meal preparation	**IADL–P**	*Use sharp utensils*	*IADL–C*
Stovetop use	**IADL–C**	*Mail bills and checks*	*IADL–C*
Mail bills and checks	**IADL–C**	*Balance a checkbook*	*IADL–C*
Pay bills by check	**IADL–C**	*Oven use*	*IADL–C*
Bathtub/shower transfer	**FM**	*Oral hygiene*	*BADL*
Small repairs	**IADL–C**	*Obtain information: auditory*	*IADL–C*
Shop	**IADL–C**	*Medication management*	*IADL–C*
Bend, lift and carry garbage	**IADL–P**	*Clean up after meal preparation*	*IADL–P*
Obtain information: visual	**IADL–C**	*Bingo*	*IADL–C*
Bingo	**IADL–C**	*Telephone use*	*IADL–C*
Telephone use	**IADL–C**	*Obtain information: visual*	*IADL–C*
Sweep	**IADL–P**	*Sweep*	*IADL–P*
Medication management	**IADL–C**	*Stovetop use*	*IADL–C*
Home safety	**IADL–C**	*Pay bills by check*	*IADL–C*
Obtain information: auditory	**IADL–C**	*Home safety*	*IADL–C*
Dress	**BADL**	*Dress*	*BADL*
Indoor walking	**FM**	*Toilet transfer*	*FM*
Stair use	**FM**	*Bend, lift and carry garbage*	*IADL–P*
Bed transfer	**FM**	*Bed transfer*	*FM*
Toilet transfer	**FM**	*Stair use*	*FM*
Oral hygiene	**BADL**	*Indoor walking*	*FM*
EASIEST		**EASIEST**	

Note. Inpatient = **Bold**; Outpatient = *Italics*; double line = median; bold line = mean. FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical.

Table 2-18 Task item hierarchy for inpatients and outpatients in rank order (1 = hardest task item; 26 = easiest task item)

PASS Task Item	Inpatients	Outpatients
FM		
Bed transfer (move from prone to supine position and rise from bed)	**24**	*24*
Stair use (ascend and descend stairs)	**23**	*25*
Toilet transfer (sit and rise from a toilet)	**25**	*22*
Bathtub/shower transfer (enter and exit tub and/or shower)	**10**	*3*
Indoor walking (walk indoors)	**22**	*26*
BADL		
Oral hygiene (clean teeth, dentures and/or mouth)	**26**	*10*
Trim toenails (groom toenails)	**2**	*2*
Dress (don and doff upper body and lower body clothing)	**21**	*21*
IADL–C		
Shop (select and purchase grocery items)	**12**	*1*
Pay bills by check (write checks for sample utility bills)	**9**	*19*
Balance checkbook (balance a checkbook after writing checks)	**1**	*8*
Mail bills and checks (prepare envelopes for mailing checks)	**8**	*7*
Telephone use (use telephone to obtain information)	**16**	*15*
Medication management (read med info / organize med according to prescription)	**18**	*12*
Obtain information: auditory (obtain information from a radio announcement)	**20**	*11*
Obtain information: visual (obtain information from a newspaper)	**14**	*16*
Small repairs (repair a flashlight)	**11**	*5*
Home safety (identify and correct hazards or problems in home safety situations)	**19**	*20*
Bingo (play bingo)	**15**	*14*
Oven use (cook muffins in an oven)	**4**	*9*
Stovetop use (cook soup on a stovetop)	**7**	*18*
Use sharp utensils (cut an apple with a sharp knife)	**5**	*6*

Table 2-18 (continued)

IADL–P		
Bend, lift, and carry garbage (lift and carry garbage sack)	**13**	*23*
Change bed linen (put on bed linens)	**3**	*4*
Sweep (clean spillage on the floor using a broom and a dust pan)	**17**	*17*
Clean up after meal preparation (perform clean up tasks after meal preparation)	**6**	*13*

Note. Inpatients (n = 60) = **Bold**; outpatients (n = 59) = *Italics*; FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL─C = Instrumental Activities of Daily Living–cognitive; IADL─P = Instrumental Activities of Daily Living–physical.

There was considerable similarity in the order of the task items between the inpatients and the outpatients (see Tables 2-17 and 2-18). Approximately 77% of the task items were ordered within the same half of the median split for both groups (i.e., task items above the median). Four of the task items (trim toenails; sweep; dress; and bed transfer) were positioned in the same order for the inpatients and the outpatients. Only two task items (shop and oral hygiene) were more difficult for the outpatients to perform than for the inpatients (see Table 2-11). The remaining 24 task items were more difficult for the inpatients to perform than for the outpatients. For both groups, approximately 80% of the task items in the harder half of the median split (i.e., above the median) were within the IADL–cognitive and IADL–physical task domains. The bathtub/shower transfer task item was the only FM domain task in the harder half of the hierarchy for both groups.

2.3.2.9 Summary of results for person ability

Examination of the logit values for person ability revealed that overall the ability or performance of the outpatients was better or more independent than that of the inpatients (see Figure 2-1). The mean logit value for the inpatients was only 2.48 (SD = 2.88) whereas for the outpatients it

was 5.93 (*SD* = 1.70). The range of ability for the inpatients was a logit value of -4.46 reflecting worst performance or lowest ability to 9.16 reflecting best performance or highest ability. The range of ability for the outpatients was logit values of 2.89 to 11.22. The range of ability for the inpatients was almost 40% broader than that of the outpatients. The mean logit value for inpatients and outpatients combined was 4.19 (*SD* = 2.93). Only 15.3% of the outpatients' logit values indicated ability at or below the mean, however for the inpatients 75.0% of the logit values were below the mean. As expected, the performance ability of the inpatients was significantly lower than that of the outpatients ($t = -7.97$, $p \leq .001$).

BEST PERFORMANCE (ABILITY)		
Logit values for Inpatients (n = 60)		Logit values for Outpatients (n = 59)
	12.00	
		11.22
	11.00	
	10.00	
9.16		*9.14*
	9.00	
		8.73; 8.34; 8.02; 8.02; 8.01; 8.00
	8.00	
7.23		*7.71; 7.45; 7.39; 7.24; 7.23; 7.22; 7.21; 7.20; 7.03*
	7.00	
6.17; 6.44; 6.45; 6.64; 6.82		*6.80; 6.49; 6.46; 6.34; 6.32; 6.31; 6.19; 6.06; 6.04; 6.04;6.01*
	6.00	
5.14; 5.14; 5.30; 5.31; 5.67		*5.92; 5.88; 5.69; 5.58; 5.57; 5.57; 5.50; 5.50; 5.41; 5.41; 5.40; 5.39; 5.30; 5.14*
	5.00	
4.02; 4.04; 4.37; 4.43; 4.93		*4.99; 4.93; 4.93; 4.61; 4.53; 4.49; 4.33; 4.33; 4.19; 4.04; 4.03*
	4.00	
3.04; 3.19; 3.47; 3.70; 3.74; 3.82; 3.87; 3.90		*3.95; 3.90; 3.90; 3.76*
	3.00	
2.09; 2.19; 2.53; 2.56; 2.56; 2.60; 2.67; 2.73 2.75; 2.96		*2.99; 2.89*
	2.00	
1.07; 1.23; 1.33; 1.66; 1.68; 1.74; 1.78; 1.89 1.98		
	1.00	
0.05; 0.12; 0.25; 0.56		
	0.00	
-0.83; -0.79; -0.25; -0.14		
	-1.00	
-1.96; -1.74		
	-2.00	
-2.87; -2.11		
	-3.00	
-3.64; -3.25		
	-4.00	
-4.46		
	-5.00	
WORST PERFORMANCE (ABILITY)		

Note: Inpatient = **Bold**; Outpatient = *Italics*.

Figure 2-1 Rasch measures of performance ability on the PASS for inpatients and outpatients

2.4 DISCUSSION

In this study we examined performance disability in patients with major depression. As hypothesized, performance disability was greater in the inpatients than the outpatients. The inpatients evidenced significantly more dependence in all 4 task domains (FM, BADL, IADL–cognitive and IADL–physical), as well as in 19 of 26 task items. Therefore, our finding is consistent with research suggesting that the level of disability parallels the level of depression (Alexopoulos et al., 1996; Oslin, Streim, Katz, Edell, & TenHave, 2000; Turner & Noh, 1988). The severity of depression in our outpatients was less than that of our inpatients, as evidenced by the lower mean GDS score and the failure to hospitalize for treatment. Nonetheless, several other differences between the groups could also account for the increased disability in the inpatients. Although scores on the mental state (3MS) examination were within normal limits in both groups, the inpatient scores were significantly lower than those of the outpatients. Similarly, on the measures of attention, information processing speed, visual search and sequencing, and mental flexibility (TMT–A and TMT–B), the outpatient scores approximated the 75th percentile whereas the inpatient scores approximated the 25th percentile. Additionally, although the two groups experienced similar medical burden, the inpatients demonstrated significantly greater limitations in active movement of the trunk and extremities than the outpatients. These cognitive and physical limitations could also account for the increased disability, which in turn, as postulated by Williamson and Schulz (1992) could trigger increased depression.

2.4.1 Task domain performance

We hypothesized that performance disability would be greatest in the IADL–cognitive domain, followed by the IADL–physical, BADL, and FM domains respectively. This was only partially

supported in the inpatient and outpatient groups. Task domain performance for the inpatients followed the progression proposed by Lawton (1983) based on the hierarchical arrangement of ADL (i.e., FM and BADL) and IADL (i.e., IADL–physical and IADL–cognitive). From the perspective of task complexity, FM tasks lie at the easiest end of the hierarchy, because they primarily involve moving the large joints and moving the body in relation to the environment, as in sitting and rising from a toilet or moving position on and rising from a bed. In contrast, tasks in the BADL domain are more difficult because they require more precise movement in manipulating task objects, for example, opening a tube of toothpaste and spreading the toothpaste onto a toothbrush. At the hardest end of the hierarchy is the IADL domain. Whereas movement in the BADL domain is largely oriented inward, toward the self, in the IADL domain, it is oriented outward, toward the environment, in tasks associated with home management and independent living in the community. In this study, IADL were divided into those having a greater physical component, such as sweeping the floor and removing garbage from the home, and those with a greater cognitive component, such as interpreting a bill and writing out a check to pay for it and using the telephone. The rationale for this division was based on the clinical observation that older adults often have more difficulty with the IADL–cognitive tasks than the IADL–physical ones. In the inpatients, where physical impairment was greater, the IADL–physical domain was the most difficult or hardest task domain followed by IADL–cognitive, then BADL, and finally the FM domain. In contrast, the IADL–cognitive domain was the most difficult or hardest task domain for the outpatients, followed by BADL, then IADL–physical, and finally, consistent with the inpatients, the FM domain. The domain order in the outpatients raises the question of whether the IADL–physical tasks on the PASS, because of their gross motor orientation, functioned more like tasks in the easier FM domain, than those in the IADL domain

for patients with less physical impairment. However, for inpatients with greater overall impairment, that is greater depressive symptomatology, cognitive impairment and physical impairment, the increased physical requirements of the more complex goal-directed movements in the IADL–physical tasks yielded greater disability.

The presence of disability in all 4 task domains in both groups is contrary to the findings of Steffens, Hays, and Kirshman (1999), where disability was confined to the IADL domain. Hence, if depression-related disability is primarily expressed as a motivational deficit, that is, undermining of the effort needed to initiate, continue, or complete tasks, our findings indicate that its influence extends to obligatory as well as discretionary tasks. However, given the greater disability in IADL than FM and BADL tasks for the patients with greater impairment (i.e., inpatients) the influence on discretionary tasks was greater. Furthermore, the magnitude of the difference between our inpatients and outpatients for the IADL tasks, compared to the BADL and FM tasks also reinforces the greater influence of depression-related disability on discretionary tasks.

2.4.2 Task item performance

The greatest disparity in task performance between the inpatients and outpatients occurred in regard to tasks associated with preparing meals (i.e., using the oven and stove, and cleanup after meals) and managing finances (i.e., paying bills by check and balancing a checkbook). There is a close similarity between this list and the tasks identified by Berkman et al. (1997) as being highly predictive of depression in primary care patients. In their study, managing money, food preparation, and light housework were within the top ten relative risk factors for depression. Their findings indicated that self-reporting of depression was almost five times greater if a

person had difficulty managing money or doing light housework (e.g., cleanup after meal preparation) than in the absence of these difficulties. The least disparity in task performance between the inpatients and outpatients occurred in tasks involving bed and chair transfers, care of the mouth, extracting critical information through hearing, and managing medications. Except for the last task (medication management), this parity emerged from comparable independence of task performance versus dependence.

Interestingly, comparison of the five easiest tasks for inpatients and outpatients revealed agreement in 4 of 5 tasks and all within the FM task domain (i.e., walking indoors; ascending and descending stairs; moving from prone to supine position and rising from a bed; and sitting and rising from a toilet). For the inpatients, the fifth task was a BADL task (i.e., cleaning teeth, dentures and/or mouth). In contrast, the fifth task for the outpatients was an IADL–physical task (i.e., lifting and carrying a garbage sack). Thus, the easiest tasks for all patients, despite level of impairment, were primarily motor tasks. A comparison done for the five hardest tasks revealed agreement for only two items -- grooming toenails (BADL) and changing bed linens (IADL–physical). For the inpatients, in contrast to the easiest tasks, the remaining three hardest tasks were IADL–cognitive (i.e., balancing a checkbook after writing checks; cooking muffins in an oven; and using sharp utensils). For the outpatients, two were IADL–cognitive (selecting and purchasing grocery items; and repairing a flashlight), and the other was a FM task (entering and exiting a tub and/or shower). For both groups the hardest tasks were those with greater complexity. There are a number of factors that contribute to the complexity of a task. The complexity is increased when the task requires greater cognitive proficiency as for performance of IADL tasks or motor proficiency and precision to maintain safety as required when grooming toenails or transferring into and out of a tub or shower. Additionally, tasks requiring

manipulation of objects (e.g., nail clippers, food items, money, utensils, bed linens, flashlight) and/or navigation of the environment (e.g., maneuvering around a bed, operating an oven) raise the level of complexity.

2.4.3 Depression-related disability

Because we rated task performance on a continuum, rather than dichotomously as independent or dependent, we were able to describe depression-related disability in terms of the nature of task dependency in addition to disability in specific tasks. As is typical for disability measurement in rehabilitation (Centers for Medicare & Medicaid Services, 2002), we graded disability based on the type of assistance given by the examiner to overcome a performance deficit and/or to reduce a substantive risk to safety. Assistance was not provided unless a performance deficit occurred and when it was given, it was provided in a systematic order with least assistive prompts given first and more assistive prompts given as needed. In contrast to the outpatients, who only needed encouragement or nondirective (e.g., "have you missed anything?") or directive prompts (e.g., "check the ingredients again"), the inpatients also required hands-on physical guidance (e.g., examiner positioned subject's hand correctly to open the medication container, but did not support the weight of the hand), and physical support (e.g., examiner physically supported subject as she got out of the tub) to complete tasks. Thus, the burden associated with caregiving was substantively greater in the inpatient group.

We hypothesized that the strength of the relationship between the impairment variables and disability variables would be stronger in the inpatients however our findings only partially supported this view. The variable exhibiting the strongest relationship to disability was physical impairment. In both groups, but particularly the inpatient group, physical impairment exhibited

stronger relationships to disability in the task domains than medical burden, depressive symptomatology, and cognitive functioning**.** In the community-dwelling elderly, as well as in subpopulations with depression (Alexopoulos et al., 1996; Steffens et al., 1999), as chronological age increases, disability also increases. Even though the inpatients spanned a wider age range, the relationship between age and disability was observed only in the outpatients and only with the IADL–physical domain. Our findings did not reveal a relationship between medical burden and disability which has been identified in older age groups (Alexopoulos et al., 1996; Steffens et al., 1999). One explanation for the difference in findings may be the difference in methods of measuring disability. We measured disability based on performance whereas Alexopoulos et al. and Steffens et al. measured disability based on self-report or interviewer-rating of self-report.

In terms of the functional domains, intercorrelations were consistently stronger in the inpatient group. A strong relationship emerged between the two IADL domains, suggesting that they are more alike than the other domains. An equally strong relationship was between the FM and IADL–physical domains. On the PASS, IADL tasks are separated between those with a substantial cognitive element and those with a substantial physical element. The strong relationship between the FM and IADL–physical domain tasks in these groups further confirms the physical aspect of these IADL. Likewise, the strength of the relationship between the cognitive and physical IADL also confirms that these tasks are more complex than those designated as FM. Overall the BADL domain relationship to the other domains was weaker in both groups although significant for the inpatients.

A unique aspect of our study was the assessment of performance disability as opposed to self-reported disability or informant reported disability. Of primary concern in measuring disability in depressive illness is that each condition be assessed independent of the other. Self-

reports of functional status are viewed as highly susceptible to the effects of depression, with patients perceiving more disability than they actually have (Kempen, van Sonderen, & Ormel, 1999). Performance testing does not avoid this dilemma. If patients refuse to perform a task or to participate in testing at all, there is no way to ascertain if this refusal stems from depression, a personality trait, test anxiety, or any number of other factors. To reduce the incidence of refusal as much as possible, we used a dynamic testing approach (Polatajko, Mandich, & Martini, 2000; Tzuriel & Haywood, 1991; Vygotsky, 1978). Cajoling patients' participation was the first prompting strategy used to elicit performance when patients failed to self-initiate a task or withdrew after they had started it. By encouraging patients to engage in tasks and then providing only the minimal assistance needed to complete them, patients' task abilities were reinforced while their task disabilities were compensated for. Thus, the use of a dynamic testing approach and a rating system that accounted for the level of assistance needed for patients to initiate, continue or complete task performance reflected depression-related disability.

2.4.4 Hierarchy of performance tasks

A primary contribution of this study is the identification of a hierarchy of performance tasks or indicators. This hierarchy may be useful for physicians who must decide between inpatient or outpatient treatment for older women presenting with major depression. Landerman and Fillenbaum (1997) proposed that risk-factor analysis for clinical disability should focus on specific rather than comprehensive measures of disability and should not assume that a risk factor (i.e., age, gender) for one domain of disability is a risk factor for another domain of disability. Similarly, the question has been posed as to whether there are sentinel tasks in which difficulty in performance of all tasks in a domain, or disability in a specific task item, is

predictive of future disability in other tasks or task domains. Our findings are consistent with those of Fulton, Katz, Jack, and Hendershot (1989), Hing and Bloom (1990), and Spector, Sidney, Murphy, and Fulton (1987) which showed that degree of domain disability or individual task item disability are different for older women whose depression results in inpatient versus outpatient treatment. Additionally, the ability of older adults to perform tasks within select domains at a satisfactory level, despite underlying health status factors, is important. Unlike other studies, our study provides information about the distribution of performance disability within and between the populations. Our findings indicate that the range of ability for patients receiving more intensive services (i.e., inpatient treatment) is broad and that their performance although typically more dependent than patients receiving less intensive services (i.e., outpatient treatment) does overlap indicating that global performance disability should not be the sole indicator for treatment disposition. Although health service providers and policy makers may presume that degree of performance disability determines the level of care or intensity of treatment a person needs, our findings suggest that need for hospitalization may be indicated (a) when performance is more disabled in select domains, namely IADL–cognitive and IADL–physical; (b) when performance reaches a certain level of disability, namely the need for more intrusive assistance (i.e., total assistance, physical support or physical guidance, continuous demonstration, and rearrangement of tasks or task environments to enable task completion); or (c) when performance is deficit across all 4 domains (i.e., FM, BADL, IADL–cognitive, IADL–physical). The level of assistance needed for task performance, and thus the level of task dependence may be a significant factor in determining need for hospitalization. This significant difference in task disability between the inpatient and outpatient groups may also suggest that the

level of task disability has the potential to be a sentinel indicator of treatment disposition for older women: inpatient versus outpatient.

2.4.5 Limitations

Our findings should be interpreted with caution given that this study had several limitations. First, the generalizability of our findings is limited by our relatively small sample of older adults with depression, all of whom were female and receiving services from the same academic health center. Because of the complexity of disability, another limitation is our method for measuring disability. Although we assessed disability using more stringent performance-testing as opposed to self- or proxy-report and selected a criterion-referenced instrument with acceptable psychometric properties, there are potentially limiting issues related to its use. The PASS incorporates 26 task items categorized within 4 task domains. Although each task is logically assigned to a domain (i.e., FM, BADL, IADL–cognitive or IADL–physical) there may be tasks that cross domains. Additionally, the subtasks of a specific task item may cross domains. Also, the PASS was designed to have a disproportionately greater number of tasks within the IADL domains versus the domains related to self maintenance and mobility. Although the PASS includes a broad range of tasks it does not include all possible tasks that individuals may perform within their individualized daily routine and individuals may be required to perform an unfamiliar task. And finally, the criteria established for performance of a task may differ from the individual's unique performance which may adversely effect scoring. These issues may confound the interpretation of depression-related disability.

2.4.6 Conclusion and recommendations

In conclusion, this study suggests that the ability to perform daily life tasks is different for older women with depression being treated as inpatients and outpatients, and that performance-based assessment of task domains and items clearly delineated these differences. Although our data provide a unique glimpse of the performance disability of older adults with depression further investigation is needed to determine the progression of and fluctuations within performance disability and the identification of sentinel tasks that may assist physicians in determining the appropriate treatment disposition and the need for change in treatment disposition.

3.0 THE IMPACT OF COGNITION ON TASK DISABILITY IN OLDER ADULTS WITH DEPRESSION

3.1 BACKGROUND AND SIGNIFICANCE OF THE PROBLEM

The cognitive impairments associated with late-life depression are regarded as substantial and disabling despite not being clearly understood. Studies describing cognitive functioning in older adults with depression (Austin et al., 1992; Boone et al., 1995; Butters et al., 2000; Butters, Bhalla et al., 2004; Butters, Whyte et al., 2004; Elderkin-Thompson, Boone, Hwang, & Kumar, 2004; Lesser et al., 1996; Lockwood, Alexopoulos, & van Gorp, 2002; Majer et al., 2004; Marin, Butters, Mulsant, Pollock, & Reynolds, 2003; Mojtabai & Ofson, 2004; Naismith et al., 2003; Nebes et al., 2000; Nebes et al., 2001; Palmer et al., 1996; Steffens, Wagner, Levy, horn, & Kirshman, 2001) have documented dysfunction in initiating, planning, problem solving, organizing,, sequencing, attention, set-shifting, speed of processing, and working memory. Researchers have employed a wide range of neuropsychological measures (e.g., Boston Naming Test [Kaplan, Goodglass, & Weintraub, 1987]; Executive Interview [Royal, Mahurin, & Gray, 1992]; finger tapping test [Reitan & Wolfson, 1993, pp.278-288]; Mattis Dementia Rating Scale [Mattis, 1976; Mattis, 1988]; Rey-Osterreith Complex Figure [Lezak, 1995]; Stroop Color and Word Test [Golden, 1978]; Trail Making Test [Reitan & Wolfson, 1985]; Wechsler Adult Intelligence Scale, 3rd edition [Wechsler, 1997]; Wisconsin Card Sorting Test [Heaton, Chelune, Talley, Kay, & Curtiss, 1993]) to identify and describe the relationship between clinical characteristics of depression and cognitive functioning. Although these neuropsychological profiles provide insight into impairment-related disability associated with late-life depression they do not identify or describe task disability, that is, disability associated with performance of

daily life tasks. Results indicate that older adults with depression have impairment on a number of traditional neuropsychological tasks however there has been little investigation of how impairment based on neuropsychological task performance translates into disability in daily life tasks.

Although there are many components of cognition, speed of processing, that is "the maximum rate at which elementary cognitive operations can be executed" (Nebes et al., 2000, p. 680), has been identified as one of the cognitive functions most affected in older adults with depression (Lockwood et al., 2002; Nebes et al., 2000). Some researchers propose that the degree to which a task is dependent upon processing speed may determine if the older adult with depression will be able to achieve successful performance (Hartlage, Alloy, Vazquez, & Dykman, 1993; Roy-Byrne, Weingartner, Bierer, Thompson, & Post, 1986; Tancer et al., 1990; Thomas, Goudemand, & Roussezux, 1999; Zakzanis, Leach, & Kaplan, 1998). For example, older adults with depression may be more dependent in tasks requiring substantial amounts of 'effortful' processing and more independent in tasks that are 'automatic' or well-integrated in the performance of routine daily tasks. Tasks requiring more effortful processing highly challenge a person's thought functions. Performance of these tasks strains the pace or speed of one's thinking process and subsequently may affect the form, content, and control of thought in addition to higher-level cognitive functions (i.e., abstraction; organization and planning; time management; cognitive flexibility; insight; judgment; and problem-solving). Little is known of the amount of processing required to perform daily life tasks such as getting in to and out of a bathtub, donning or doffing a shirt, managing medications, or clean up after preparing a meal. In addition, little is known of the differences in performance of daily life tasks for persons who have faster or slower speed of processing. Identification of the cognitive processes fundamental

to the daily functioning of older adults with depression is needed to develop compensatory strategies that will ultimately improve the functional outcomes of late-life depression (Lockwood et al., 2002).

The overall aim of this study was to examine the impact of cognition on task disability in patients with major depression. With this in mind, we examined performance-disability on the Performance Assessment of Self-Care Skills (PASS) (Rogers & Holm, 1989) in a community-based sample of older adults receiving inpatient or outpatient treatment for major depression. The patients were separated into groups by speed of processing (i.e., SLOWER and FASTER patients) based on their performance on the Trail Making Test – B (TMT–B) (Lezak, 1983; Reitan, 1958). Disability was examined in 4 task domains: (1) functional mobility (FM), (2) basic activities of daily living (BADL), and instrumental activities of daily living (IADL), which for the purposes of this study were subdivided into (3) IADL with a greater physical component (IADL–physical) and (4) IADL with a greater cognitive component (IADL–cognitive). Rasch analysis was used to create a hierarchy of task difficulty using the Performance Assessment of Self-Care Skills (PASS) (Rogers & Holm, 1989) to describe the relative difficulty of task domains and task items for patients with slower or faster speed of processing. Identification of the relative level of difficulty of items within FM, BADL, IADL–physical, and IADL–cognitive task domains could aid in planning evaluations and interventions. Specifically, we hypothesized that: (1) performance disability in FM, BADL, IADL–cognitive, and IADL–physical would be greater in the patient group with SLOWER speed of processing than in the patient group with FASTER speed of processing; (2) performance disability would be greatest in the IADL–cognitive, followed by the IADL–physical, then BADL, and lastly FM in both the SLOWER and FASTER speed of processing patient samples; and (3) the strength of the relationship between

impairment and disability in the FM, BADL, IADL–cognitive, and IADL–physical domains would be stronger in the SLOWER speed of processing patient sample than the FASTER speed of processing patient sample.

3.2 METHODS

3.2.1 Participants

The data analyzed for this study were derived from two methodological studies of functional status assessment. To be included in the analysis, participants had to: (a) have a diagnosis of major depression; (b) be female, at least 60 years of age, and medically stable; (c) report a history of routinely performing targeted tasks and current disability in at least one FM, BADL, or IADL based on the Older Adult Resources and Services (OARS) Multidimensional Functional Assessment ADL questions (Fillenbaum, 1988); and, (d) be community dwelling. For outpatients the psychiatric diagnosis was made by a board certified geriatric psychiatrist; for inpatients it was achieved through consensus of the geriatric psychiatrists on the research unit. The analysis was limited to women because they are the primary homemakers for the current generation of elders and the majority of IADL tasks typically assessed in geriatrics have usually been performed by women. Exclusion criteria were: (a) coexisting dementia [i.e., Mini-Mental State Examination score $\leq$ 24] (Folstein, Folstein, & McHugh, 1975); and (b) presence of an uncorrected, auditory or visual impairment that impaired the ability to participate in performance testing.

3.2.2 Procedures

Potential participants were referred to the inpatient and outpatient studies with their physicians' approvals. All participants signed informed consent. After approval by the University of Pittsburgh Institutional Review Board, 44 inpatients and 55 outpatients were recruited from the geriatric psychiatry services of the now, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania. After eligibility requirements were verified, demographic and impairment data were gathered on the first day of testing. Disability assessment was done within 3 days of admission for the inpatients and on the 2nd of 3 days of testing for the outpatients. It was conducted in the occupational therapy clinic by a research associate, trained and supervised by a licensed occupational therapist. Thus, all patients were tested on familiar tasks but in an unfamiliar environment.

3.2.3 Instruments

Performance disability was measured with the PASS–Clinic Version (Rogers & Holm, 1989). The PASS places subjects in 26 situational tasks: 5 FM, 3 BADL, 14 IADL–cognitive, and 4 IADL–physical (see Table 3-1).

Table 3-1 PASS task items

Functional Mobility
Bed transfer (move from prone to supine position and rise from bed)
Stair use (ascend and descend stairs)
Toilet transfer (sit and rise from a toilet)
Bathtub/shower transfer (enter and exit tub and/or shower)
Indoor walking (walk indoors)
Basic Activities of Daily Living
Oral hygiene (clean teeth, dentures and/or mouth)
Trim toenails (groom toenails)
Dress (don and doff upper body and lower body clothing)
Instrumental Activities of Daily Living – cognitive
Shop (select and purchase grocery items)
Pay bills by check (write checks for sample utility bills)
Balance checkbook (balance a checkbook after writing checks)
Mail bills and checks (prepare envelopes for mailing checks)
Telephone use (use telephone to obtain information)
Medication management (read medication information and organize medication according to prescription)
Obtain information: auditory (obtain information from a radio announcement)
Obtain information: visual (obtain information from a newspaper)
Small repairs (repair a flashlight)
Home safety (identify and correct hazards or problems in home safety situations)
Bingo (play bingo)
Oven use (cook muffins in an oven)
Stovetop use (cook soup on a stovetop)
Use sharp utensils (cut an apple with a sharp knife)
Instrumental Activities of Daily Living – physical
Bend, lift, and carry garbage (lift and carry garbage sack)
Change bed linen (put on bed linens)
Sweep (clean spillage on the floor using a broom and a dust pan)
Clean up after meal preparation (perform clean up tasks after meal preparation)

Tasks are presented by the examiner in a standardized manner, which includes the verbal instructions and the placement of task objects. Independence of performance is rated on a 4-point, ordinal scale, with 3 indicating that no assistance was given for task initiation, continuation, or completion and 0 indicating that total assistance was required. Scores are based on the frequency (e.g., occasional or continuous) and type of assistance provided by the examiner during testing (see Table 3.2).

Table 3-2 PASS independence scoring criteria

SCORE	CRITERIA
INDEPENDENT PERFORMANCE	
3	No assists given for task initiation, continuation, or completion
2	No Level 7-9 assists given, but occasional Level 1-6 assists given
1	No Level 9 assists given; occasional Level 7 or 8 assists given, or continuous Level 1-6 assists given
0	Level 9 assists given, or continuous Level 7 or 8 assists given; or unable to initiate, continue, or complete subtasks or task
DEPENDENT PERFORMANCE	

Assistance is provided only when needed, with the least assistive prompt used first followed by progressively more assistive and intrusive prompts. The types of assistance ordered from least to most assistive are: verbal supportive, verbal non-directive, verbal directive, gestures, task/environmental rearrangement, demonstration, physical guidance, physical support, and total assistance (see Table 3-3).

Table 3-3 PASS prompt hierarchy

	LEVEL	PROMPT	DESCRIPTION
LEAST RESTRICTIVE			
VERBAL	1	Verbal support	Encouragement
	2	Verbal non-directive	Cue to alert that something is not right
	3	Verbal directive	Tell person what to do next
GESTURE	4	Gestures	Point at task object
	5	Task/environmental rearrangement	Break task down
	6	Demonstration	Assessor demonstrates/person follows
PHYSICAL	7	Physical guidance	"Hands down" – move body part into place
	8	Physical support	"Hands up" – lift body part/clothes/support
	9	Total assist	Assessor does task or subtasks for the person
MOST RESTRICTIVE			

Scores of 0 through 3 were applied to the subtasks that comprise each of the 26 tasks. Thus, a task rating is the mean of the subtask scores for each item. Inter-rater reliability was established by administering the PASS to 23 older adults, representative of the following populations: well-elderly, depression, osteoarthritis, cardiopulmonary disease, and dementia. For task independence (Clinic Version), for the 5 FM items, raters agreed on 507 of 525 observations (percent agreement 97%; average kappa 0.43); for the 3 BADL items raters agreed on 439 of 480 observations (percent agreement 91%; average kappa 0.38); for the 4 IADL–physical items raters agreed on 436 of 462 observations (percent agreement 94%; average kappa 0.43); and for the 14 IADL–cognitive items raters agreed on 1,682 of 1,805 observations (percent agreement 93%;

average kappa 0.29). Clinically, the decision consistency of the raters' observations was excellent. Because the PASS is a criterion-referenced instrument the low probabilistic kappa coefficients are not remarkable (Cicchetti & Feinstein, 1990).

Exploratory factor analysis was used to investigate the unidimensionality of the PASS independence construct. We chose the commonly used approach, Cattell's scree test (Cattell, 1966), which examines the scree plot of the eigenvalues plotted against the factor numbers. The 26-item PASS will theoretically have 26 possible underlying factors. Each factor has an eigenvalue indicating the amount of variation in the items accounted for by each factor. Although there is no definitive limit on the plot, a scree plot is generally interpreted by examining the number of factors before the plotted line levels out or shows an "elbow." Cattell's rule is to drop all components after the one starting the elbow (Dunteman, 1989). Determining where the "elbow" begins is somewhat subjective, however if the points on the plot have a tendency to level out, these eigenvalues are usually considered close enough to zero that they can be ignored. Independence scores for the 26 task items of the PASS for 1158 subjects were examined by factor analysis using SPSS 12.0. Examination of the scree plot revealed a dominance of the first factor. The largest eigenvalue of the correlation matrix for the 26 items was 3.44 times larger than the second largest eigenvalue and accounted for over 37% of the variance. Using Cattell's scree test, examination of the PASS independence data revealed the presence of a dominant construct and therefore the assumption of unidimensionality for the Rasch model was met (Hambleton, Swaminathan, & Rogers, 1991, pp.9-10).

Medical burden was measured on the Cumulative Illness Rating Scale for Geriatrics (CIRS–G) (Miller & Towers, 1991; Miller et al., 1992). Affective and physical impairment were measured with the Geriatric Depression Scale – 15 item version (GDS) (Yesavage et al., 1982-

1983) and Keitel Functional Test (KFT) (Eberl, Fasching, Rahlfs, Schleyer, & Wolf, 1976), respectively. The measures of cognitive impairment were the Modified Mini-Mental State (3MS) Examination (Teng & Chui, 1987) and Trail Making Test – A and B (TMT–A; TMT–B) (Lezak, 1983; Reitan, 1958). Perceived general health status on the day of testing was measured on a visual analogue scale with 0 representing worst and 10 representing best health state imagined.

As previously stated, our sample of older adults with depression was grouped by speed of processing based on their performance on the TMT–B (Lezak, 1983; Reitan, 1958). The TMT is a paper-and-pencil task consisting of two parts. For TMT–A the person is instructed to connect circles numbered 1 to 25, randomly distributed on a sheet of paper, in ascending sequence (i.e., 1-2-3-4, etc.). The requirements are similar for TMT–B however it is more difficult due to the addition of circles with letters (from A to L) on the worksheet and the instruction to alternate in numeric and alphabetical order (i.e., 1-A-2-B-3-C-4-D, etc.). The person is instructed to complete the task as quickly and accurately as possible. Each score represents the amount of time in seconds required to complete that part of the test. The usual cutoff time of 300 seconds (Lezak, 1995, pp. 335-384) was not utilized; instead the actual time for task completion was recorded. This decision was made to more accurately obtain speed of processing by older adults with depression. The TMT–B was chosen for grouping because of its greater cognitive processing demands (Arbuthnott & Frank, 2000; Arnett & Labowitz, 1995; Crowe, 1998; O'Donnell, MacGregor, Dabrowski, Oestreicher, & Romero, 1994). Performance of the TMT–B was compared to the set of norms established by Tombaugh (2004) because they allow for a more precise comparison of performance for varying ages and education. Participants were stratified by age and education. Patients scoring below the 50th percentile for their age and

education level were included in the SLOWER group and patients scoring above or equal to the 50th percentile for their age and education level were included in the FASTER group.

3.2.4 Data Analysis

Descriptive statistics were calculated using SPSS version 12.0 to describe the sociodemographic, pathology, impairment, and disability data for each group (i.e., ALL, SLOWER and FASTER patients). Relationships among variables were examined using Pearson correlations. Independent *t*-tests were performed to investigate the magnitude and significance of differences between the SLOWER and FASTER groups for level of independence in the 4 task domains and the 26 task items. A Bonferroni adjustment was used due to the repeated intercorrelations and *t*-tests within each task domain. The level of independence in the 4 task domains and the 26 task items for the SLOWER and FASTER patients was examined by Rasch Item Response Theory (IRT) or Rasch analysis using Winsteps version 3.55. Rasch analysis was used to transform the ordinal scale scores of the PASS into interval measures on a logarithmic scale. The transformations estimate the difficulty of the item and the ability of the person along a hierarchical "more than/less than" line of inquiry. The interval sizes are determined by the actual item and person performance probabilities detected in the data. Hierarchies of task difficulty and person ability are established using the measure on the interval or logit (log odds unit) scale. Therefore the unit intervals between locations on the item or person logit scale have a consistent value or meaning. This log transformation allows for comparison of the relative difficulty of tasks to other tasks, and for comparison of the relative ability of a person to other persons. This study used a score of zero as the midpoint of difficulty or ability. Items with more positive logit values were harder to perform while those with a more negative value were easier to perform. In

contrast, persons with more positive logit values had a greater likelihood of performing tasks independently than persons with lower or negative logit values.

In an ideal situation the empirical data would be a perfect fit with the mathematical description of the Rasch model, however the data collected through clinical observation describes performance in the real world so all data deviates from the model to some extent. Item and person performance deviations from the expected model, or the fit statistics, are determined by examining the degree of error associated with each logit. The fit discrepancy is reported as INFIT and OUTFIT. The INFIT and OUTFIT statistics each use a slightly different method for determining the fit of an item or person to the Rasch model. The INFIT statistic is an information-weighted sum which gives more weight to performances of persons closer to the item value to provide more insight into the item's performance. The OUTFIT statistic is not weighted, and therefore influenced more by outlying scores. That is, INFIT statistics are sensitive to unexpected performance close to the person's ability in contrast to OUTFIT statistics which are sensitive to unexpected performance that is farther away from the person's ability (Fortinsky, Garcia, Sheehan, Madigan, & Tullai-McGuiness, 2003). The INFIT and OUTFIT mean square errors of each item were examined for values ≤ 0.5 or ≥ 1.7 which could indicate a poor fit with the model for clinical observation tests (Linacre & Wright, 1994). For example, an INFIT or OUTFIT value of 1.7 indicates 70% more variation in the observed performance than the Rasch model predicts (Bond & Fox, 2001). An item is identified as problematic when both INFIT and OUTFIT values deviate from the model. A problematic item requires further investigation to determine if recoding is required due to unexpected observed performance or small sample sizes, or to determine if the item should to be combined with another item,

removed, or left as is. The analysis of fit is essential if the interpretation of the Rasch measures is to be useful (Smith, 1998, 2000; Smith, Schumacker, & Busch, 1998; Smith & Suh, 2003).

PASS independence data for the FASTER and SLOWER patients were analysed together, thus placing all data on a common metric. The raw independence scores for all subtasks (n = 161 per group) of the 26 PASS task items were included in the Rasch analysis. In doing so, a logit value was obtained for each subtask. An average task item logit value was obtained by calculating the mean of the subtask logit values. The same process was used to calculate the INFIT and OUTFIT statistics for each task item, that is the mean of the subtask INFIT values and OUTFIT values. Table 3-4 provides an example of the calculations. Task domain average logit, INFIT, and OUTFIT values were obtained by calculating the mean of respective values for the task items within the domain (i.e., FM, BADL, IADL–cognitive, and IADL–physical).

Table 3-4 Calculation of the average logit, INFIT and OUTFIT values for the IADL–cognitive shop task for the SLOWER patients

Logit	INFIT	OUTFIT	Subtask #	Shop Subtask
1.30	1.14	1.91	1	Selects all 4 items on the shopping list correctly
-1.28	1.53	2.09	2	Selects the correct cash (matches receipt amount)
0.19	1.46	1.92	3	Selects the correct coupon for the matching item
2.49	1.03	3.12	4	Reaches for and gathers toilet paper
3.02	0.93	1.49	5	Places toilet paper
1.14	1.22	2.11	Average values for Shop Task Item	

3.3 RESULTS

3.3.1 Participant characteristics

Table 3-5 reports sociodemographic, pathology and impairment data for all patients ($N = 99$) and grouped by speed of processing (SLOWER, $n = 76$; FASTER, $n = 23$). The typical patient was a 75 year old widowed, Caucasian, female, with at least a high school education and living alone but spending at least 8 hours per day with another person. Medical burden (CIRS-G) was low to moderate. On the impairment measures, the patients with slower speed of processing evidenced significantly greater depressive symptomatology (GDS); cognitive impairment (3MS, TMT–A; TMT–B), and physical impairment (KFT), and perceived a lower general health status than those patients with faster speed of processing. Additionally, although all patients were receiving psychogeriatric treatment there were significantly more patients in the SLOWER group receiving more intensive service (i.e., inpatient hospitalization). The SLOWER patients required on average approximately 10 minutes longer to complete the PASS however the time difference for PASS completion was not statistically significant between the SLOWER and FASTER patients.

Table 3-5 Characteristics of all patients and by speed of processing

	ALL Patients ($N = 99$)	SLOWER Patients ($n = 76$)	FASTER Patients ($n = 23$)		Significance
	M (CI)	*M* (CI)	*M* (CI)	*t*, FET[a]	*p*
Sociodemographic variables					
Age, years	74.52 (73.40, 75.63)	74.21 (72.87, 75.55)	75.52 (73.50, 77.54)	-1.11	.273
Race (% Caucasian)	87.90	84.20	100.00	4.13[a]	.063
Education (% ≥ high school)	69.70	67.10	78.30	1.04[a]	.438
Marital status (% widowed)	66.70	67.10	65.20	0.01[a]	1.000
Living status (% lives alone)	58.60	55.30	69.60	1.49[a]	.240
Supervision % > 8 hours spent with another person	30.30	32.90	21.70	1.04 [a]	.438
% outpatient	55.60	46.10	87.00	11.96 [a]	.01**
Pathology and impairment variables					
CIRS-G Scores range 0 to 56	11.22 (10.55, 11.89)	11.50 (10.73, 12.27)	10.27 (8.90, 11.65)	1.60	.118
GDS Scores range 0 to 15	5.78 (4.92, 6.64)	6.54 (5.56, 7.52)	3.26 (1.84, 4.68)	3.89	.01**
3MS Scores range 0 to 100	91.81 (90.63, 92.98)	90.83 (89.42, 92.23)	95.04 (93.55, 96.54)	3.89	.01**
TMT–A Scores in seconds	71.19 (58.88, 83.51)	80.29 (64.83, 95.75)	41.13 (35.84, 46.43)	4.79	.01**
TMT–B Scores in seconds	186.67 (163.27, 210.06)	218.20 (191.62, 244.78)	82.48 (74.08, 90.88)	9.73	.01**
KFT Scores range 4 to 100	24.91 (22.27, 27.55)	27.36 (24.15, 30.56)	16.83 (14.66, 18.99)	5.50	.01**
Perceived health status Scores range 0 to 10	6.14 (5.58, 6.71)	5.67 (5.02, 6.32)	7.70 (6.78, 8.61)	-3.68	.01**
PASS (completion) Time in minutes	67.11 (61.96, 72.26)	69.29 (63.05, 75.53)	60.00 (51.76, 68.24)	1.84	.072

Note. CIRS–G = Cumulative Illness Rating Scale for Geriatrics; GDS = Geriatric Depression Scale; 3MS = Modified Mini-Mental State; TMT–A = Trail Making Test – A; TMT–B = Trail Making Test – B; KFT = Keitel Functional Test; PASS = Performance Assessment of Self-Care Skills.
> impairment = higher scores (CIRS–G; GDS; TMT–A; TMT–B; KFT); > impairment = lower scores (MMSE; 3MS; perceived health status).
FET[a] = Fishers exact test for Pearson Chi-Square.
**$p \leq 0.001$ before Bonferroni adjustment.

3.3.2 Disability

3.3.2.1 Factors related to disability

In the SLOWER patients, age was not significantly correlated with any of the task domains (see Table 3-6). The impairment variables of most interest for the SLOWER patients were affective, as measured on the GDS, and movement capability, as measured on the KFT. Both variables significantly correlated with the FM, BADL, and IADL–physical domains. The strength of the relationships for the affective variable ranged from r = -0.30 to -0.34, suggesting that as depressive symptoms increased (i.e., higher GDS scores), independence decreased (i.e., lower PASS scores). The strongest relationships were found with the KFT (r = -0.28 to -0.55), indicating that as physical impairment increased (i.e., higher KFT scores), independence in performing BADL, FM, and IADL–physical tasks, and to a lesser extent IADL–cognitive tasks, decreased (i.e., lower PASS scores). The only other significant correlation was for cognitive impairment, and only as measured on the TMT–B, with the BADL domain (r = -0.32). As the SLOWER patients' cognitive impairment increased (i.e., more time to complete TMT–B), they were more dependent in performance of BADL tasks (i.e., lower PASS scores on items such as clean teeth, dentures and/or mouth; groom toenails; don and doff upper body and lower body clothing). None of the other measures of cognitive impairment yielded significant correlations with any of the task domains. For the FASTER patients, neither age nor affective, cognitive, or physical impairment variables significantly correlated with any of the task domains (see Table 3-6). The strongest relationship for the FASTER patients was found in the BADL domain with cognitive impairment, as measured on the 3MS (r = -0.40) followed by relationships in the FM domain with cognitive impairment (TMT–A, r = 0.39; 3MS, r = -0.38) and physical impairment (KFT, r = -0.38).

Table 3-6 Relationships among demographic, and pathology and impairment variables

	SLOWER Patients (n = 76)				FASTER Patients (n = 23)			
Factors	PASS Task Domains				PASS Task Domains			
	FM	BADL	IADL–C	IADL–P	FM	BADL	IADL–C	IADL–P
Demographic variable								
Age	0.02	-0.07	-0.07	-0.03	0.04	-0.02	0.06	0.06
Pathology and impairment variables								
CIRS–G	-0.17	-0.21	-0.13	-0.05	-0.03	0.11	-0.32	-0.16
GDS	-0.34*	-0.33*	-0.30	-0.34*	-0.06	-0.23	-0.16	-0.22
3MS	-0.01	0.14	0.29	0.21	-0.38	-0.40	0.22	-0.07
TMT–A	-0.03	-0.23	-0.10	-0.07	0.39	0.04	-0.01	-0.03
TMT–B	-0.13	-0.32*	-0.11	-0.13	0.02	0.05	-0.08	0.10
KFT	-0.52**	-0.55**	-0.28	-0.42**	-0.38	-0.24	-0.11	-0.28

Note. FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical; CIRS–G = Cumulative Illness Rating Scale for Geriatrics; GDS = Geriatric Depression Scale; 3MS = Modified Mini-Mental State; TMT–A = Trail Making Test – A; TMT–B = Trail Making Test – B; KFT = Keitel Functional Test.
*Correlation is significant at the .05 level (2-tailed) with Bonferroni adjustment. **Correlation is significant at the .01 level (2-tailed) with Bonferroni adjustment.

For the SLOWER patients, there were significant correlations among all domains with the strength of the relationships ranging from r = 0.49 to 0.80 (see Table 3-7). The correlation between the two IADL domains (i.e., IADL–cognitive and IADL–physical) was the strongest (r = 0.80). For the FASTER patients, the only significant correlation was between the IADL–cognitive and IADL–physical domains and the strength of this relationship (r = 0.76) was comparable to the relationship of these domains for the SLOWER patients (r = 0.80).

Table 3-7 Relationships among disability variables

	SLOWER Patients (n = 76)				FASTER Patients (n = 23)			
Factors	PASS Task Domains				PASS Task Domains			
	FM	BADL	IADL–C	IADL–P	FM	BADL	IADL–C	IADL–P
Disability variables								
FM	1.00				1.00			
BADL	0.49**	1.00			0.04	1.00		
IADL–C	0.51**	0.53**	1.00		0.14	-0.01	1.00	
IADL–P	0.74**	0.54**	0.80**	1.00	0.15	0.10	0.76**	1.00

Note. FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical.
**Correlation is significant at the .01 level (2-tailed) with Bonferroni adjustment.

3.3.2.2 Task domains

Task performance of the FASTER patients was significantly ($p \leq .01$ or $p \leq .05$) more independent than that of the SLOWER patients in 3 of the 4 task domains, that is IADL–cognitive, BADL, and IADL–physical (see Table 3-8). For both groups, tasks in the FM domain were performed with the greatest independence, followed by the BADL, IADL–physical, and IADL–cognitive domains. As might be expected, there was the greatest disparity (see t value) between the groups for the more complex IADL–cognitive domain. However unexpectedly, the domain with the next greatest disparity was the BADL domain, followed by the IADL–physical and FM domains.

Table 3-8 Differences between FASTER and SLOWER patients for task domains, ranked by *t* value

	SLOWER Patients (n = 76)	FASTER Patients (n = 23)	*t*-test	Significance
	M (CI)	*M* (CI)	*t*	*p*
PASS Task Domain				
IADL–C	2.14 (2.01, 2.27)	2.50 (2.42, 2.59)	-4.78	.01**
BADL	2.30 (2.17, 2.44)	2.70 (2.56, 2.83)	-4.16	.01**
IADL–P	2.25 (2.08, 2.42)	2.61 (2.38, 2.59)	-2.59	.05*
FM	2.62 (2.50, 2.74)	2.72 (2.63, 2.81)	-1.38	.170

Note. FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living – cognitive; IADL–P = Instrumental Activities of Daily Living – physical; > disability = lower scores
*$p \leq .013$ before Bonferroni adjustment ; **$p \leq .003$ before Bonferroni adjustment.

3.3.2.3 Task items

Both the SLOWER and FASTER patients performed the same two task items with the greatest independence however the task items of greatest dependence were different for each group (see Table 3-9). The SLOWER patients walked indoors with the greatest independence (indoor walking, FM, M = 2.80) followed by ascending and descending the stairs (stair use, FM, M = 2.79) and balanced the checkbook with the greatest dependence (balance checkbook, IADL–cognitive, M = 1.76). Similarly, the FASTER patients walked indoors with the greatest independence (indoor walking, FM, M = 3.00) followed by ascending and descending the stairs (stair use, FM, M = 2.96). However, in contrast to the SLOWER patients, the FASTER patients shopped with the greatest dependence (shop, IADL–cognitive, M = 2.04).

Table 3-9 Differences between SLOWER and FASTER patients for task items, ranked by *t* value

	SLOWER Patients (*n* = 76)	FASTER Patients (*n* = 23)	*t*-test	Significance
	M (CI)	*M* (CI)	*t*	*p*
PASS Task Item				
Balance checkbook (IADL–C)	1.76 (1.57, 1.95)	2.52 (2.30, 2.74)	-5.31	.01**
Trim toenails (BADL)	1.89 (1.59, 2.18)	2.65 (2.44, 2.86)	-4.51	.01**
Telephone use (IADL–C)	2.24 (2.08, 2.40)	2.70 (2.49, 2.90)	-4.01	.01**
Bingo (IADL–C)	2.46 (2.25, 2.68)	2.91 (2.79, 3.04)	-3.79	.01**
Mail bills and checks (IADL–C)	1.19 (1.75, 2.08)	2.35 (2.14, 2.56)	-3.49	.05**
Medication management (IADL–C)	2.07 (1.95, 2.19)	2.43 (2.22, 2.65)	-3.21	.003
Small repairs (IADL–C)	2.14 (2.00, 2.29)	2.52 (2.30, 2.74)	-3.15	.003
Oven use (IADL–C)	2.06 (1.84, 2.27)	2.52 (2.27, 2.78)	-3.04	.004
Clean up after meal preparation (IADL–P)	2.15 (1.93, 2.38)	2.65 (2.34, 2.96)	-2.78	.008
Indoor walking (FM)	2.80 (2.65, 2.96)	3.00[a]	-2.77	.007
Pay bills by check (IADL–C)	2.03 (1.84, 2.21)	2.39 (2.18, 2.61)	-2.74	.008
Home safety (IADL–C)	2.14 (2.00, 2.29)	2.43 (2.22, 2.65)	-2.56	.014
Bend, lift, and carry garbage (IADL–P)	2.34 (2.13, 2.55)	2.65 (2.44, 2.86)	-2.29	.025
Dress (BADL)	2.35 (2.17, 2.53)	2.65 (2.44, 2.86)	-2.24	.029
Change bed linen (IADL–P)	1.90 (1.65, 2.15)	2.26 (1.96, 2.56)	-2.08	.042
Stair use (FM)	2.79 (2.63, 2.95)	2.96 (2.87, 2.05)	-1.91	.059
Stovetop use (IADL–C)	2.07 (1.88, 2.26)	2.31 (2.00, 2.61)	-1.51	.139

Table 3-9 (continued)

Obtain information: visual (IADL–C)	2.55 (2.35, 2.75)	2.78 (2.49, 3.07)	-1.49	.143
Shop (IADL–C)	1.96 (1.86, 2.05)	2.04 (1.95, 2.13)	-1.35	.183
Sweep (IADL–P)	2.70 (2.54, 2.87)	2.87 (2.60, 3.14)	-1.27	.212
Obtain information: auditory (IADL–C)	2.68 (2.51, 2.84)	2.78 (2.56, 3.01)	-1.18	.244
Oral hygiene (BADL)	2.68 (2.56, 2.79)	2.78 (2.60, 2.97)	-1.06	.294
Bathtub/shower transfer (FM)	2.14 (1.92, 2.36)	2.30 (2.03, 2.58)	-0.95	.347
Use sharp utensils (IADL–C)	2.27 (2.06, 2.48)	2.35 (2.04, 2.66)	-0.59	.557
Toilet transfer (FM)	2.73 (2.61, 2.86)	2.65 (2.44, 2.86)	0.49	.626
Bed transfer (FM)	2.69 (2.54, 2.84)	2.70 (2.49, 2.90)	-0.09	.926

Note. FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical; > disability = lower scores.
[a]no variability in sample
*$p \leq .002$ after Bonferroni adjustment. **$p \leq .000$ after Bonferroni adjustment.

For the SLOWER patients, approximately 15% of mean performance scores were at a performance level that required substantive assistance (i.e., score < 2.00) (see Table 3-9) (see Table 3-2 for PASS independence scoring criteria). Specifically, assistance was required in the form of: (a) occasional physical support or physical guidance, or (b) continuous demonstration, rearrangement of task or environment, gestures, verbal directives, verbal non-directives, and/or verbal encouragement (see Table 3-3 for PASS prompt hierarchy). The task items at this performance level spanned the IADL–cognitive (mail bills and checks, and shop), IADL–physical (change bed linen), and BADL (trim toenails) domains. In contrast, 100% of the mean performance scores of individual task items for the FASTER patients fell at a functional level

(i.e., score ≥ 2.00) indicating that participants required: occasional demonstration, rearrangement of task or environment, gestures, verbal directives, verbal non-directives, and/or verbal encouragement. Approximately 85% of the mean performance scores for the SLOWER patient group fell at this level.

The FASTER patients performed significantly better ($p \leq .05$ or .01) than the SLOWER patients on 5 of the 26 individual task items (see Table 3-9). These items included 4 IADL – cognitive tasks (balance checkbook, telephone use, bingo, and mail bills and checks) and 1 BADL task (trim toenails). The FASTER patients performed over 96%, that is 25 of the 26 task items, more independently than the SLOWER patients. The toilet transfer task (FM) was the only item that the SLOWER patients (M = 2.73) performed more independently than the FASTER patients (M = 2.65) however the performance between the 2 groups was not statistically different.

3.3.2.4 Fitting PASS data to the Rasch model

Tables 3-10 and 3-11 summarize the INFIT and OUTFIT statistics for the 4 PASS task domains and the 26 task items for the SLOWER and FASTER patients. As previously stated, items with both INFIT and OUTFIT mean square values of ≤ 0.5 or ≥ 1.7 are considered problematic for clinical observation tests (Bond & Fox, 2001). The goodness-of-fit statistics for task domains indicated that all task domains demonstrated acceptable goodness-of-fit to the model (see Table 3-10). Although several task items (see Table 3-11) have fit statistic values either ≤ 0.5 or ≥ 1.7 only 4 task items had both INFIT and OUTFIT mean square values outside the suggested range, indicating the need to inspect these items for problematic subtasks. The task items requiring examination included 1 IADL–cognitive task (i.e., obtain information: auditory for the FASTER

patients), 2 FM tasks (i.e., toilet transfer for the SLOWER patients and indoor walking for the FASTER patients), and 1 BADL task (i.e., oral hygiene for the SLOWER patients). Inspection of the problematic items will be reviewed by domain in order of difficulty beginning with the most difficult problematic item (i.e., obtain information: auditory for the FASTER patients) and continuing through all subsequent problematic items within that domain (i.e., IADL–cognitive). Then the next most difficult problematic item will be examined following the same sequence.

Table 3-10 Rasch measures of difficulty by PASS task domains for SLOWER and FASTER patients

Average Logit	Average INFIT MNSQ	Average OUTFIT MNSQ	Task Domain
HARDEST			**HARDEST**
0.79	1.02	0.79	**IADL–P**
0.70	1.02	1.11	**IADL–C**
0.00 MEAN			
-1.00	1.04	0.48	*IADL–P*
-1.21	1.43	1.81	**BADL**
-1.37	1.04	0.97	*IADL–C*
-1.96	1.58	1.45	**FM**
-3.79	0.92	0.96	*BADL*
-3.87	1.08	1.05	*FM*
EASIEST			**EASIEST**

Note. SLOWER patients = **Bold**; FASTER patients = *Italics*; FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical.

Table 3-11 Rasch measures of difficulty by PASS task items for SLOWER and FASTER patients

Average Logit	Average INFIT MNSQ	Average OUTFIT MNSQ	PASS Task Domain	PASS Task Item
HARDEST			**HARDEST**	**HARDEST**
3.14	1.23	1.21	**BADL**	**Trim toenails**
2.75	1.04	0.93	**IADL–P**	**Change bed linen**
2.49	0.81	0.70	**IADL–C**	**Balance a checkbook**
1.82	0.88	0.99	*IADL–C*	*Shop*
1.74	0.55	0.44	**IADL–C**	**Oven use**
1.51	1.65	1.44	**IADL–P**	**Bathtub/shower transfer**
1.42	0.77	0.76	**IADL–C**	**Mail bills and checks**
1.36	0.77	0.59	**IADL–P**	**Clean up after meal preparation**
1.18	0.63	0.65	*IADL–C*	*Use of sharp utensils*
1.17	0.65	0.60	**IADL–C**	**Use of sharp utensils**
1.14	1.22	2.11	**IADL–C**	**Shop**
1.14	1.02	1.28	**IADL–C**	**Small repairs**
1.02	1.87	1.68	*FM*	*Bathtub/shower transfer*
0.97	0.96	0.68	**IADL–C**	**Stovetop use**
0.75	1.01	0.48	*IADL–P*	*Change bed linen*
0.75	0.85	0.66	**IADL–C**	**Pay bills by check**
0.62	1.03	0.54	*IADL–C*	*Stovetop use*
0.37	1.37	0.87	**IADL–C**	**Bingo**
0.18	0.84	0.31	*IADL–C*	*Obtain information: visual*
0.18	1.18	0.73	**IADL–P**	**Bend, lift and carry garbage**
0.09	0.98	0.33	*IADL–P*	*Clean up after meal preparation*
0.05	1.08	1.49	**IADL–C**	**Obtain information: visual**
0.00 MEAN				

Table 3-11 (continued)

-0.08	0.94	0.54	*IADL–C*	*Oven use*
-0.21	1.20	1.22	**IADL–C**	**Medication management**
-0.25	1.19	1.48	**IADL–C**	**Telephone use**
-0.48	1.09	0.94	**IADL–C**	**Home safety**
-0.54	1.27	0.23	*IADL–P*	*Sweep*
-0.55	1.46	2.32	**IADL–C**	**Obtain information: auditory**
-1.02	0.94	1.09	*IADL–C*	*Mail bills and checks*
-1.12	1.07	0.91	**IADL–P**	**Sweep**
-1.21	1.14	1.17	**BADL**	**Dress**
-1.41	0.95	1.25	*IADL–C*	*Small repairs*
-1.99	1.36	1.25	*IADL–C*	*Medication management*
-2.25	1.05	0.40	**FM**	**Indoor walking**
-2.30	0.95	1.28	*IADL–C*	*Balance a checkbook*
-2.54	1.56	1.17	**FM**	**Stair use**
-2.66	2.05	1.84	*IADL–C*	*Obtain information: auditory*
-2.85	1.60	1.19	**FM**	**Bed transfer**
-2.97	0.94	0.68	*IADL–C*	*Telephone use*
-2.98	0.76	0.78	*IADL–C*	*Home safety*
-3.39	0.82	0.72	*BADL*	*Oral hygiene*
-3.55	0.98	1.17	*BADL*	*Trim toenails*
-3.68	2.02	3.05	**FM**	**Toilet transfer**
-3.74	1.47	1.47	*IADL–C*	*Bingo*
-3.78	0.86	0.84	*IADL–C*	*Pay bills by check*
-3.82	0.78	0.65	*FM*	*Bed transfer*
-3.86	0.70	0.66	*FM*	*Toilet transfer*
-4.28	0.88	0.86	*IADL–P*	*Bend, lift and carry garbage*
-4.43	0.96	0.98	*BADL*	*Dress*
-5.56	1.92	3.06	**BADL**	**Oral hygiene**
-5.77	0.95	1.19	*FM*	*Stair use*
-6.94	MIN	MIN	*FM*	*Indoor walking*
EASIEST			**EASIEST**	**EASIEST**

Note. SLOWER patients = **Bold**; FASTER patients = *Italics*; FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical. Double vertical lines indicate task items at comparable levels of difficulty within groups.

3.3.2.5 Inspection of PASS task items in the IADL–cognitive domain

Table 3-12 shows the INFIT and OUTFIT mean square error statistics for the FASTER patients for the two subtasks of obtain information–auditory task item in the IADL–cognitive domain. The INFIT and OUTFIT mean square error values for subtask #1 reflect extreme scores (i.e., MIN = minimum estimated measure) and the mean square error values for subtask #2 exceeded 1.7, indicating an unexpected response pattern in that subtask (Bond & Fox, 2001). Examination of the frequency statistics for obtain information–auditory subtasks revealed that for subtask #1 all 23 patients scored 3, that is all patients were able to independently report the problem accurately, and for subtask #2 (i.e., reporting a plausible action from auditory information), 19 of the 23 patients scored 3, 2 of the patients scored 2, 1 patient scored 1, and 1 patient scored 0 representing complete dependence (i.e., the need for total assistance to perform the subtask). Although the model may not anticipate these responses, in clinical practice performance can reflect extreme scores (i.e., total independence or total dependence). Due to the individuality of patients, clinicians know that performance can reflect any point of the continuum from disability to ability including the extremes of performance and that performance may also cluster at certain levels of independence versus being equally distributed along the continuum. Additionally, subtask #1 and subtask #2 address different aspects of performance. Subtask #1 (i.e., reporting a problem from auditory information) reflects attention-related body function that requires sustaining attention on a specific task for a short period of time. In contrast, subtask #2 (i.e., reporting a plausible action from auditory information) requires solving a simple problem. Furthermore, performance of these subtasks in a testing situation may be less affected by impairments associated with major depression then during performance of "real world" daily tasks requiring the range of attention-related body functions (e.g., shifting, dividing, or sharing

attention, or sustaining attention over an extended timeframe) and problem solving-related activities (e.g., solving a complex problem involving multiple and interrelated issues). A large OUTFIT mean square error can be triggered when there are little to no responses in score categories (e.g., 19 patients with a score of 3; 2 patients with a score of 2; 1 patient with a score of 1; 1 patient with a score of 0) which results in insufficient observations for the values to be accurately estimated (Fortinsky et al., 2003). Bond and Fox (2001) recommend combining low response categories with adjacent categories where logically or clinically relevant. J. C. Rogers and M. B. Holm (personal communication, August 22, 2005), authors of the PASS (1989) recommended that the subtasks not be combined as each reflects discrete criteria, that is subtask #1 requires or emphasizes the body function of sustaining attention and subtask #2 requires or emphasizes the activity of solving simple problems.

Table 3-12 Analysis of subtask responses for the PASS obtain information–auditory task tem for FASTER patients (n = 23)

INFIT MNSQ	OUTFIT MNSQ	Subtask #	Obtain Information–auditory Subtask
MIN	MIN	1	Reports the problem accurately
2.05	1.84	2	Reports a plausible action for the problem

Note. MIN = minimum estimated measure.

3.3.2.6 Inspection of PASS task items in the FM domain

Table 3-13 shows the INFIT and OUTFIT mean square error statistics for the SLOWER patients for the six subtasks of the toilet transfer task item. Both the INFIT and OUTFIT mean square error values for subtasks #2, #3, #4, and #5 exceeded 1.7, indicating an unexpected response

pattern at those subtasks (Bond & Fox, 2001). To determine if recoding, combining, or removal of items was indicated, the data for the SLOWER patients (n = 76) for these subtasks were examined and frequency statistics were calculated. For all 4 subtasks more than 85% of the patients scored 3, representing independent performance of the subtasks and 1% to 3% of the patients scored 0, representing complete dependence (i.e., the need for total assistance to perform the subtask), no patients scored 1, and 1% to 13% of the patients scores were 2. As previously stated, due to the individuality of patients, clinicians know that performance can reflect any point of the continuum from disability to ability including the extremes of performance. Additionally, these specific subtasks (i.e., turns to position self in front of toilet; lowers self onto toilet; reaches for and gathers toilet paper; and places toilet paper) reflect movement-related body functions that are well-integrated in the performance of routine daily tasks, such as toileting. They reflect automatic performance of a FM task and performance of these subtasks seems to be less affected by impairments associated with major depression. Therefore, in "real world" performance of community-based older adults we anticipate a high frequency of independent scores or extremes of scores in the subtasks of a FM task. A large OUTFIT mean square error can be triggered when there are little to no responses in score categories (e.g., 1 patient with a score of 0 or 2; no patients with a score of 1) which results in insufficient observations for the values to be accurately estimated (Fortinsky et al., 2003). Bond and Fox (2001) recommend combining low response categories with adjacent categories where logically or clinically relevant. J. C. Rogers and M. B. Holm (personal communication, August 22, 2005), authors of the PASS (1989) recommended that the subtasks not be combined as each reflects discrete criteria which requires or emphasizes different body functions or a combination of different degrees of body functions.

Table 3-13 Analysis of subtask responses for the PASS toilet transfer task item for SLOWER patients

INFIT MNSQ	OUTFIT MNSQ	Subtask #	Toilet Transfer Subtask
1.46	1.02	1	Locates bathroom
2.40	6.02	2	Turns to position self in front of toilet
2.40	6.54	3	Lowers self onto toilet
2.10	1.76	4	Reaches for and gathers toilet paper
2.22	2.16	5	Places toilet paper
1.53	0.77	6	Raises self from toilet

The INFIT and OUTFIT mean square error statistics for the three subtasks of the indoor walking task item are shown in Table 3-14 for the FASTER patients. Similar to the subtask #1 for the IADL–cognitive task item (i.e., obtain information: auditory) the INFIT and OUTFIT mean square error values for all 3 subtasks of the indoor walking task item reflect extreme scores (i.e., MIN = minimum estimated measure). Examination of the frequency statistics for these subtasks revealed that all 23 patients scored 3 for each of the subtasks. The specific subtasks (i.e., walk, turn, walk back, and maintain balance across 3 designated areas) reflect movement-related activities that are well-integrated in the performance of routine daily tasks. Although the model may not anticipate these scores, "real" performance does reflect extremes of performance. Additionally, the indoor walking task item reflects automatic performance within the FM domain and the ability to walk across a room seems to be less affected by impairments associated with major depression. Therefore, in "real world" performance we anticipate a high frequency of independent scores or extremes of scores in the subtasks of a FM task, such as indoor walking.

Examination of the subtasks indicated that it may be appropriate to combine the subtasks due to all patients achieving the same score for all 3 subtasks, or that it may be appropriate to remove 2 of the 3 subtasks as they reflect parallel criteria or similar aspects of mobility-related activity (i.e., walks across area, turns, and walks back and maintains balance). However, adhering to Wright's re-categorization guidelines (Wright & Linacre, 1992), J. C. Rogers and M. B. Holm (personal communication, August 22, 2005), recommended that the subtasks not be recoded, combined or removed for the following reasons. First, combining or removing categories (i.e., subtasks) would decrease the definition of the task item that is the degree to which the task requires mobility-related activity would be reduced or narrowed. Secondly, in this study Rasch analysis is incorporated to compare performance difficulty between patients with slower and faster speed of processing and although the data did not reveal a "perfect" fit with the mathematical description of the model for the FASTER patients the data did fit the model for the SLOWER patients (INFIT = 1.05, OUTFIT = 0.40). As we collected the data through clinical observation of performance in the "real world" we know that the data will deviate from the model to some extent and accept the deviation as a difference in performance between the patients.

Table 3-14 Analysis of subtask responses for the PASS indoor walking task item for the FASTER patients (n = 23)

INFIT MNSQ	OUTFIT MNSQ	Subtask #	Indoor Walking Subtask
MIN	MIN	1	Walks across 1st area, turns, and walks back and maintains balance
MIN	MIN	2	Walks across 2nd area, turns, and walks back, and maintains balance
MIN	MIN	3	Walks across 3rd area, turns, and walks back, and maintains balance

Note. MIN = minimum estimated measure.

3.3.2.7 Inspection of PASS task items in the BADL domain

Table 3-15 shows the INFIT and OUTFIT mean square error statistics for the thirteen subtasks of the oral hygiene task item in the BADL domain for the SLOWER patients. The oral hygiene task item differs from the majority of other PASS task items, in that it has four performance variations. Determination of a variation is dependent on individual oral hygiene factors; that is if the patient has teeth only, dentures only, dentures and teeth, or no teeth or dentures. Subtasks #1 (i.e., adjust water adequately) and #13 (i.e., turns off water faucet completely) are the only subtasks included for all variations. Subtasks #2 (i.e., manipulates toothpaste container to obtain adequate paste on brush), #3 (i.e., brushes all parts of mouth where teeth are present thoroughly), #4 (i.e., rinses mouth or residue and spits into appropriate container), and #11 (i.e., rinses brush thoroughly) are included in variations for teeth. Subtasks #5 (i.e., manages all aspects of solution preparation adequately), #6 (removes all dentures from mouth), #7 (places dentures in solution in a controlled manner with adequate solution coverage), #8 (brushes and rinses all parts of dentures thoroughly), #9 (i.e., inserts all dentures into mouth correctly and securely), #10 (i.e.,

guards against damaging dentures adequately), #11 (i.e., rinses brush thoroughly), and #12 (i.e., cleans gums thoroughly) are included for dentures. And subtask #12 (i.e., cleans gums thoroughly) is used for those individuals having no teeth or dentures. The task item variations are important to consider when examining the problematic subtasks as they affect the frequency statistics as the number of patients performing a subtask varied (e.g., SLOWER patients $n = 76$, subtask #2 $n = 57$, subtask #8 = 48). The INFIT and OUTFIT mean square error values for subtasks #2, #3, #4, #8, and #11 had unexpected response patterns for the NON-READMIT patients (i.e., values ≤ 0.5 or ≥ 1.7) (see Table 3-14). Subtasks #10 and #13 also required examination as the INFIT and OUTFIT values for these subtasks reflect extreme scores (i.e., MIN = minimum estimated measure) that is all patients had the same score (see Table 3-14). For all the problematic subtasks there was a disproportionately higher frequency of scores (> 89%) reflecting independent performance (i.e., score = 3) when compared with the total number of patients for which the subtask was scored. Additionally, each of the subtasks requires or emphasizes different body functions and activities. The oral hygiene subtasks require varying degrees of fine hand use (i.e., picking up, grasping, and manipulating tools), mobility (i.e., changing and maintaining body position), and higher-level cognitive functions (i.e., organization and planning, judgment, and problem-solving). As with the other task items, the subtasks were not recoded, removed, or combined as each subtask reflects discrete criteria for performance of the task item (J. C. Rogers & M. B. Holm, personal communication, August 22, 2005).

Table 3-15 Analysis of subtask responses for the PASS oral hygiene task item for the SLOWER patients (n = 76)

INFIT MNSQ	OUTFIT MNSQ	Subtask #	Oral hygiene Subtask
0.98	1.11	1	Adjusts water adequately
3.73	5.09	2	Manipulates toothpaste container to obtain adequate paste on brush
2.26	3.96	3	Brushes all parts of mouth where teeth are present thoroughly
2.73	6.23	4	Rinses mouth of residue and spits into appropriate container
1.77	1.66	5	Manages all aspects of solution preparation adequately
0.97	0.97	6	Removes all dentures from mouth
0.96	0.99	7	Places dentures in solution in a controlled manner with adequate solution coverage
2.28	3.99	8	Brushes and rinses all parts of dentures thoroughly
1.27	1.87	9	Inserts all dentures into mouth correctly and securely
MIN	MIN	10	Guards against damaging dentures adequately
2.69	5.95	11	Rinses brush thoroughly
1.47	1.88	12	Cleans gums thoroughly
MIN	MIN	13	Turns off water faucet completely

Note. MIN = minimum estimated measure

3.3.2.8 Summary of results across task domains

The value of equating using the Rasch model is the placement of all items on the same ability metric which allows for comparison of the relative difficulty of tasks to other tasks. Table 3-10 displays the average values or logits of the task domains for the SLOWER and FASTER

patients. The task domains are ordered starting with the hardest task domain to the easiest task domain. The IADL–physical task domain was the hardest for both groups, followed by IADL–cognitive, BADL, and finally FM. Performance of each task domain was consistently more difficult (i.e., higher average logit values) for the SLOWER patients than the FASTER patients.

3.3.2.9 Summary of results within task domains

Examination of results within task domains provides information for measuring specific function. It is also useful for assessing the extent to which each task domain is stretched within the hierarchy. The hardest task item within the FM domain for both SLOWER and FASTER patients was the bathtub/shower transfer (enter and exit tub and/or shower) task (see Table 3-16). The remaining FM tasks were ordered differently for the SLOWER and FASTER patients although all remaining tasks were easier for both groups to perform (i.e., negative average logit values). For the SLOWER patients indoor walking (walks indoors) was the second most difficult task, followed by stair use (ascends and descends stairs), then bed transfer (move from prone to supine position and rise from bed) and toilet transfer (sit and rise from a toilet) was the easiest task. In contrast, for the FASTER patients bed transfer was the second most difficult task, followed by toilet transfer, stair use, and then indoor walking which was the easiest task. Performance of each FM task item was consistently more difficult for the SLOWER patients (i.e., higher average logit values) than the FASTER patients.

Table 3-16 Rasch measures of difficulty for FM task items for SLOWER and FASTER patients

HARDEST		**HARDEST**	
SLOWER Patients (n = 76)		FASTER Patients (n = 23)	
Average Logit	PASS Task Item	Average Logit	PASS Task Item
1.51	**Bathtub/shower transfer**	1.02	*Bathtub/shower transfer*
-2.25	**Indoor walking**	-3.82	*Bed transfer*
-2.54	**Stair use**	-3.86	*Toilet transfer*
-2.85	**Bed transfer**	-5.77	*Stair use*
-3.68	**Toilet transfer**	-6.94	*Indoor walking*
EASIEST		**EASIEST**	

Note. SLOWER patients = **Bold**; FASTER patients = *Italics*; FM = Functional Mobility.

The BADL task item hierarchy for the SLOWER patients differed from the FASTER patients (see Table 3-17). For the SLOWER patients trim toenails (groom toenails) was the hardest task item, followed by dress (dons and doffs upper body and lower body clothing) and then oral hygiene (cleaning teach, dentures and/or mouth) was the easiest task. Trim toenails was a hard task for the SLOWER patients, that is it has a positive average logit value whereas the average logit values for the dress and oral hygiene tasks were negative. Oral hygiene was the hardest task for the FASTER patients, followed by trim toenails and dress. All the BADL task items represented easier tasks (i.e., negative average logit values) for the FASTER patients. Similar to the FM task items, performance of each BADL task item was consistently more difficult for the SLOWER patients (i.e., higher average logit values) than the FASTER patients.

Table 3-17 Rasch measures of difficulty for BADL task items for SLOWER and FASTER patients

HARDEST		**HARDEST**	
SLOWER Patients (n = 76)		FASTER Patients (n = 23)	
Average Logit	PASS Task Item	Average Logit	PASS Task Item
3.14	**Trim toenails**	-3.39	*Oral hygiene*
-1.31	**Dress**	-3.55	*Trim toenails*
-5.56	**Oral hygiene**	-4.43	*Dress*
EASIEST		**EASIEST**	

Note. SLOWER patients = **Bold**; FASTER patients = *Italics*; BADL = Basic Activities of Daily Living.

None of the 14 tasks within the IADL–cognitive domain were ordered the same for both the SLOWER and FASTER patients (see Table 3-18). Although the IADL–cognitive tasks were ordered differently for the SLOWER and FASTER patients, there were over 85% of the tasks hardest or easiest (i.e., above or below the median) for the SLOWER patients that were similarly hardest or easiest for the FASTER patients. The balance a checkbook task was among the harder tasks for the SLOWER patients but was among the easier tasks for the FASTER patients. Similarly the obtain information: visual task was among the harder tasks for the FASTER patients but was among the easier tasks for the SLOWER patients. The hardest IADL–cognitive task for the SLOWER patients was balance a checkbook (balance a checkbook after writing checks) and the easiest task for them was obtain information: auditory (obtain information from a radio announcement). In contrast the hardest IADL–cognitive task for the outpatients was shop (selects and purchases grocery items) and the easiest task for them was pay bills by check (writing checks to pay utility bills). Performance of each IADL–cognitive task item was more

difficult for the SLOWER patients (i.e., higher average logit values) than the FASTER patients with the exception of the shop, use sharp utensils, and obtain information: visual task items which were harder for the FASTER patients.

Table 3-18 Rasch measures of difficulty for IADL–cognitive task items for SLOWER and FASTER patients

HARDEST		**HARDEST**	
SLOWER Patients (*n* = 76)		FASTER Patients (*n* = 23)	
Average Logit	PASS Task Item	Average Logit	PASS Task Item
2.49	**Balance a checkbook**	1.82	*Shop*
1.74	**Oven use**	1.18	*Use sharp utensils*
1.42	**Mail bills and checks**	0.62	*Stovetop use*
1.17	**Use sharp utensils**	0.18	*Obtain information: visual*
1.14	**Small repairs**	-0.08	*Oven use*
	Shop	-1.02	*Mail bills and checks*
0.97	**Stovetop use**	-1.41	*Small repairs*
0.75	**Pay bills by check**	-1.99	*Medication management*
0.37	**Bingo**	-2.30	*Balance a checkbook*
0.05	**Obtain information: visual**	-2.66	*Obtain information: auditory*
-0.21	**Medication management**	-2.97	*Telephone use*
-0.25	**Telephone use**	-2.98	*Home safety*
-0.48	**Home safety**	-3.74	*Bingo*
-0.55	**Obtain information: auditory**	-3.78	*Pay bills by check*
EASIEST		**EASIEST**	

Note. SLOWER patients = **Bold**; FASTER patients = *Italics*; IADL–C = Instrumental Activities of Daily Living–cognitive. Double line = median.

The hardest task item within the IADL–physical domain for both SLOWER and FASTER patients was the change bed linen (put on bed linens) task followed by the clean up after meal preparation (perform clean up tasks after meal preparation) which was the second hardest task for both groups (see Table 3-19). The bend, lift and carry garbage (lift and carry garbage sack) task and the sweep (clean spillage on the floor using a broom and a dust pan) were easier tasks for both the SLOWER and FASTER patients, however the sweep task was easiest for the SLOWER patients whereas the bend, lift and carry garbage task was easiest for the FASTER patients. Similar to the IADL–cognitive task items, performance of each IADL–physical task item was more difficult for the SLOWER patients (i.e., higher average logit values) than the FASTER patients with the exception of the sweep task item which was harder for the FASTER patients although still an easier task (i.e., negative average logit value).

Table 3-19 Rasch measures of difficulty for IADL–physical task items for SLOWER and FASTER patients

HARDEST		**HARDEST**	
SLOWER Patients (*n* = 76)		FASTER Patients (*n* = 23)	
Average Logit	PASS Task Item	Average Logit	PASS Task Item
2.75	**Change bed linen**	0.75	*Change bed linen*
1.36	**Clean up after meal preparation**	0.09	*Clean up after meal preparation*
0.18	**Bend, lift and carry garbage**	-0.54	*Sweep*
-1.12	**Sweep**	-4.28	*Bend, lift and carry garbage*
EASIEST		**EASIEST**	

Note. SLOWER patients = **Bold**; FASTER patients = *Italics*; IADL–P = Instrumental Activities of Daily Living–physical.

3.3.2.10 Summary of results across task items

The logit values of the task items for the SLOWER and FASTER patients are ordered in Table 3-11 starting with the hardest task item ending with the easiest task item. Overlap of task items or the same logit value for task items occurred only twice. For the SLOWER patients the IADL–cognitive task of selects and purchases grocery items (shop; average logit = 1.14) was as difficult as the IADL–cognitive task of repairing a flashlight (small repairs; average logit = 1.14); for the FASTER patients the IADL–cognitive task of obtaining information from a newspaper (obtain information: visual; average logit = 0.18) was as difficult as the IADL–physical task of lift and carry garbage sack (bend, lift and carry garbage; average logit = 0.18) for the SLOWER patients.

The task items for the SLOWER patients stratified into 23 separate levels (see Table 3-11), with the following task items at comparable levels of difficulty: use sharp utensils, shop, and small repairs; and medication management and telephone use. Similarly, the task items for the FASTER patients stratified into 22 separate levels (see Table 3-11), with the following task items at similar levels of difficulty: telephone use and home safety; bingo and pay bills by check; and bed transfer and toilet transfer.

For the SLOWER patients, trim toenails (BADL) was the hardest task item and oral hygiene (BADL) was the easiest task item (see Tables 3-20 and 3-21). In contrast, for the FASTER patients shop (IADL–cognitive) was the hardest task item and indoor walking (FM) was the easiest task item. For the SLOWER patients, the hardest tasks to perform (i.e., task items above the mean) included 10 IADL–cognitive tasks (balance a checkbook; oven use; mail bills and checks; use sharp utensils; shop; small repairs; stovetop use; pay bills by check; bingo; and obtain information: visual); 3 IADL–physical tasks (change bed linens; clean up after meal preparation; and bend, lift and carry garbage); 1 BADL task (trim toenails); and 1 FM task

(bathtub/shower transfer). The easiest tasks for the SLOWER patients to perform (i.e., task items below the mean) included 4 IADL–cognitive tasks (medication management; telephone use; home safety; and obtain information: auditory); 1 IADL–physical task (sweep); 2 BADL tasks (dress and oral hygiene); and 4 FM tasks (indoor walking; stair use; bed transfer; and toilet transfer). For the FASTER patients, the hardest tasks to perform included 4 IADL–cognitive tasks (shop; use sharp utensils; stovetop use; and obtain information: visual); 2 IADL–physical task (change bed linens and clean up after meal preparation); no BADL tasks; and 1 FM task (bathtub/shower transfer). The easiest tasks for the FASTER patients to perform included 10 IADL–cognitive tasks (oven use; mail bills and checks; small repairs; medication management; balance a checkbook; obtain information: auditory; telephone use; home safety; bingo; and pay bills by check); 2 IADL–physical tasks (sweep and bend, lift and carry garbage); 3 BADL tasks (oral hygiene; trim toenails; and dress); and 4 FM tasks (bed transfer; toilet transfer; stair use; and indoor walking). All the IADL–cognitive and IADL–physical tasks that were easier for the SLOWER patients to perform were still harder than their easier BADL and FM tasks. This arrangement also occurred in the task item hierarchy for the FASTER patients with the exception of bingo (IADL–cognitive), pay bills by check (IADL–cognitive), and bend, lift, and carry garbage task (IADL–physical) which were easier for the FASTER patients to perform than select BADL tasks (oral hygiene and trim toenails) and FM tasks (bed and toilet transfers). For the SLOWER patients, approximately 58% or 15 of the 26 task items were positioned toward the difficult or hard end of the hierarchy (i.e., above the mean), whereas less than 27% or 7 of the 26 task items where similarly positioned for the FASTER patients.

Table 3-20 Task item hierarchy for SLOWER and FASTER patients

HARDEST	SLOWER Patients (n = 76)	**HARDEST**	FASTER Patients (n = 23)
PASS Task Item	PASS Task Domain	PASS Task Item	PASS Task Domain
Trim toenails	**BADL**	*Shop*	*IADL–C*
Change bed linens	**IADL–P**	*Use sharp utensils*	*IADL–C*
Balance a checkbook	**IADL–C**	*Bathtub/shower transfer*	*FM*
Oven use	**IADL–C**	*Change bed linens*	*IADL–P*
Bathtub/shower transfer	**FM**	*Stovetop use*	*IADL–C*
Mail bills and checks	**IADL–C**	*Obtain information: visual*	*IADL–C*
Clean up after meal preparation	**IADL–P**	*Clean up after meal preparation*	*IADL–P*
Use sharp utensils	**IADL–C**	*Oven use*	*IADL–C*
Shop	**IADL–C**	*Sweep*	*IADL–P*
Small repairs	**IADL–C**	*Mail bills and checks*	*IADL–C*
Stovetop use	**IADL–C**	*Small repairs*	*IADL–C*
Pay bills by check	**IADL–C**	*Medication management*	*IADL–C*
Bingo	**IADL–C**	*Balance a checkbook*	*IADL–C*
Bend, lift and carry garbage	**IADL–P**	*Obtain information: auditory*	*IADL–C*
Obtain information: visual	**IADL–C**	*Telephone use*	*IADL–C*
Medication management	**IADL–C**	*Home safety*	*IADL–C*
Telephone use	**IADL–C**	*Oral hygiene*	*BADL*
Home safety	**IADL–C**	*Trim toenails*	*BADL*
Obtain information: auditory	**IADL–C**	*Bingo*	*IADL–C*
Sweep	**IADL–P**	*Pay bills by check*	*IADL–C*
Dress	**BADL**	*Bed transfer*	*FM*
Indoor walking	**FM**	*Toilet transfer*	*FM*
Stair use	**FM**	*Bend, lift and carry garbage*	*IADL–P*
Bed transfer	**FM**	*Dress*	*BADL*
Toilet transfer	**FM**	*Stair use*	*FM*
Oral hygiene	**BADL**	*Indoor walking*	*FM*
EASIEST		**EASIEST**	

Note. SLOWER patients = **Bold**; FASTER patients = *Italics*; double line = median; bold line = mean. FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical.

Table 3-21 Task item hierarchy for SLOWER and FASTER patients in rank order (1 = hardest task item; 26 = easiest task item)

PASS Task Item	SLOWER Patients	FASTER Patients
FM		
Bed transfer (move from prone to supine position and rise from bed)	**24**	*21*
Stair use (ascend and descend stairs)	**23**	*25*
Toilet transfer (sit and rise from a toilet)	**25**	*22*
Bathtub/shower transfer (enter and exit tub and/or shower)	**5**	*3*
Indoor walking (walk indoors)	**22**	*26*
BADL		
Oral hygiene (clean teeth, dentures and/or mouth)	**26**	*17*
Trim toenails (groom toenails)	**1**	*18*
Dress (don and doff upper body and lower body clothing)	**21**	*24*
IADL–C		
Shop (select and purchase grocery items)	**9**	*1*
Pay bills by check (write checks for sample utility bills)	**12**	*20*
Balance checkbook (balance a checkbook after writing checks)	**3**	*13*
Mail bills and checks (prepare envelopes for mailing checks)	**6**	*10*
Telephone use (use telephone to obtain information)	**17**	*15*
Medication management (read med info / organize med according to prescription)	**16**	*12*
Obtain information: auditory (obtain information from a radio announcement)	**19**	*14*
Obtain information: visual (obtain information from a newspaper)	**15**	*6*
Small repairs (repair a flashlight)	**10**	*11*
Home safety (identify and correct hazards or problems in home safety situations)	**18**	*16*
Bingo (play bingo)	**13**	*19*
Oven use (cook muffins in an oven)	**4**	*8*
Stovetop use (cook soup on a stovetop)	**8**	*5*
Use sharp utensils (cut an apple with a sharp knife)	**11**	*2*

Table 3-21 (continued)

IADL–P		
Bend, lift, and carry garbage (lift and carry garbage sack)	**14**	*23*
Change bed linen (put on bed linens)	**2**	*4*
Sweep (clean spillage on the floor using a broom and a dust pan)	**20**	*9*
Clean up after meal preparation (perform clean up tasks after meal preparation)	**7**	*7*

Note. SLOWER patients (*n* = 76) = **Bold**; FASTER patients (*n* = 23) = *Italics*; FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical.

There was considerable similarity in the order of task items between the SLOWER patients and the FASTER patients (see Tables 3-20 and 3-21). Approximately 85% of the task items were ordered within the same half of the median split for both groups (i.e., task items above the median). The clean up after meal preparation task was positioned in the same order for the SLOWER patients and the FASTER patients. There were 5 task items (shop; use of sharp utensils; obtain information: visual; sweep; and oral hygiene) more difficult for the FASTER patients to perform than for the SLOWER patients (see Table 3-10). The remaining 21 task items were more difficult for the SLOWER patients to perform than for the FASTER patients. For the SLOWER patients 11 of the 13 task items (84.6%) in the harder half of the median split (i.e., above the median) were within the IADL–cognitive and IADL–physical task domains and for the FASTER patients 12 of the 13 items (92.3%) were in these domains. The bathtub/shower transfer task item was the only FM domain task in the harder half of the hierarchy for both groups.

3.3.2.11 Summary of results for person ability

Examination of the logit values for person ability revealed that overall the ability or performance of the FASTER patients tended to cluster in the better or more independent half of the hierarchy

whereas the performance of the SLOWER patients spanned the length of the hierarchy, reflecting performance both better and worse than the FASTER patients (see Figure 3-1). The mean logit value for the SLOWER patients was 4.53 (*SD* = 2.90) whereas for the FASTER patients it was 5.55 (*SD* = 1.56). The range of ability for the SLOWER patients was 16.42 logits (-4.80 to +11.62) whereas the range of ability for the FASTER patients was only 7.46 (+0.40 to +7.86). The range of ability for the SLOWER patients was almost 55% broader than that of the FASTER patients. The mean logit value for SLOWER and FASTER patients combined was 4.76 (*SD* = 2.68). Only 13.0% of the FASTER patients' logit values indicated ability below the mean, however for the SLOWER patients 48.7% of the logit values were below the mean. As expected, the performance ability of the SLOWER patients was significantly lower than that of the FASTER patients ($t = -2.19$, $p \leq .05$).

BEST PERFORMANCE (ABILITY)		
Logit values for SLOWER Patients (*n* = 76)		Logit values for FASTER Patients (*n* = 23)
	12.00	
11.62		
	11.00	
10.11		
	10.00	
9.52		
	9.00	
8.71; 8.39		
	8.00	
7.16; 7.17; 7.38; 7.55; 7.57; 7.59; 7.76		*7.86; 7.17; 7.16; 7.13*
	7.00	
6.34; 6.38; 6.39; 6.52; 6.68; 6.77; 6.80; 6.81 **6.01; 6.25**		*6.85; 6.62; 6.44; 6.42; 6.42*
	6.00	
5.62; 5.62; 5.62; 5.71; 5.71; 5.73; 5.73; 5.90 **5.23; 5.23; 5.30; 5.45; 5.45; 5.45**		*5.86; 5.73; 5.56; 5.53; 5.40; 5.12*
	5.00	
4.32; 4.46; 4.61; 4.66; 4.72; 4.78; 4.82; 4.90 **4.09; 4.17; 4.18; 4.22; 4.31**		*4.94; 4.83; 4.83; 4.77; 4.77; 4.18*
4.00	4.00	
3.05; 3.12; 3.19; 3.23; 3.28; 3.43; 3.72; 3.97		*3.59*
	3.00	
2.20; 2.29; 2.75; 2.77; 2.81; 2.90; 2.95		
	2.00	
1.22; 1.49; 1.85		
	1.00	
0.15; 0.36		*0.40*
	0.00	
-0.15; -0.05		
	-1.00	
-1.92; -1.71		
	-2.00	
	-3.00	
-3.49		
	-4.00	
-4.80		
	-5.00	
WORST PERFORMANCE (ABILITY)		

Note: SLOWER patients = **Bold**; FASTER patients = *Italics*.

Figure 3-1 Rasch measures of performance ability on the PASS for SLOWER and FASTER patients

3.4 DISCUSSION

In this study we examined the impact of cognition on task disability in patients with major depression. Our findings support and extend previous studies in which neuropsychological dysfunction was described in older adults with depression. We grouped patients according to their speed of processing as rated on the TMT–B compared to normative data and participants were stratified by age and education (Tombaugh, 2004). The severity of depression in our SLOWER patients was significantly greater than that of our FASTER patients, as evidenced by the higher mean GDS score and a greater percentage of SLOWER patients receiving inpatient services. Although scores on the mental state (3MS) examination were within normal limits in both groups, the SLOWER patients had significantly lower scores than the FASTER patients. Similarly, on measures of attention, speed of processing, visual search and sequencing, and mental flexibility (TMT–A and TMT–B), the FASTER patients' scores approximated the 50th percentile whereas the scores of the SLOWER patients were below the 10th percentile. Additionally, although the two groups experienced similar medical burden, the SLOWER patients demonstrated significantly greater limitations in movement of the trunk and extremities and perceived their general health status as significantly lower compared to the FASTER patients. Our finding is consistent with research indicating that increasing severity of depression is associated with impairment in cognitive processing and specifically impairment in speed of processing (Boone et al., 1995; Butters, Whyte et al., 2004; Lesser, 1996; Lockwood, 2002; Zakzanis et al., 1998).

3.4.1 Task domain performance

Our findings partially supported our hypothesis that performance disability in FM, BADL, IADL–physical, and IADL–cognitive task domains would be greater in the patient group with SLOWER speed of processing than in the patient group with FASTER speed of processing. The data revealed a significant difference between the FASTER and SLOWER patients in the BADL, IADL–cognitive, and IADL–physical domains. Although the FASTER patients' mean score for the FM task domain was more independent then the SLOWER patients' mean score, the difference was not statistically significant. As we hypothesized, performance disability was greatest in the IADL–cognitive, followed by the IADL–physical, then BADL, and lastly FM for both patients with SLOWER and FASTER speed of processing. The task domain performance for both groups followed the progression proposed by Lawton (1983) based on the hierarchical arrangement of ADL (i.e., FM and BADL) and IADL (i.e., IADL–physical and IADL–cognitive). From the perspective of task complexity, FM tasks lie at the easiest end of the hierarchy, because they primarily involve moving the large joints and moving the body in relation to the environment, as in walking indoors or ascending and descending stairs. In contrast, tasks in the BADL domain are more difficult because they require more precise movements to manipulate task objects, for example, donning, buttoning, and doffing an upper extremity garment. At the hardest end of the hierarchy is the IADL domain. Whereas movement in the BADL domain is largely oriented inward, toward the self, in the IADL domain, it is oriented outward, toward the environment, in tasks associated with home management and independent living in the community. In this study, IADL were divided into those having a greater physical component, such as sweeping the floor and removing garbage from the home, and those with a greater cognitive component, such as interpreting a bill and writing out a check

to pay for it and using the telephone. The rationale for this division was based on the clinical observation that older adults often have more difficulty with the IADL–cognitive tasks than the IADL–physical ones. Lawton's hierarchical task domain arrangement may correspond with the automatic and effortful processing criteria described by Hartlage, Alloy, Vazquez, and Dykman (1993). Hartlage and colleagues (p. 248) outline the criteria for automatic processing as: 1) the operation takes place without requiring attention or conscious awareness; 2) the process occurs in parallel without interfering with other operations or stressing the capacity limitations of the system; and 3) the process occurs without subject intention or control. In contrast, the criteria for effortful processing are: 1) the process requires attention and thereby takes place serially, inhibits other pathways, and is influenced by cognitive capacity limitations; 2) the efficiency of the process improves with practice; and 3) the process can be used to cause learning. The more problem-solving, that is cognitive functioning, a task requires the more effortful the processing. Hence, we infer that IADL tasks, although varying in the amount of cognitive resources they require, would in general be arranged toward the effortful or hardest end of the effortful-automatic continuum. Tasks within the FM domain which are learned through natural development and practice would be representative of automatic processing and located toward the other end, that is the easiest end of the effortful-automatic continuum and BADL tasks would fall between the IADL and FM task domains in the continuum. Our findings are then consistent with evidence (Hartlage et al.) suggesting that depression interferes with tasks requiring effortful operations (e.g., IADL–cognitive and IADL–physical) and that depression seldom interferes with tasks associated with automatic processes (e.g., FM). In other words, we would anticipate greater disability in the IADL task domains, less disability in the BADL domain, and little to no disability in the FM domain. Additionally, Hartlage and colleagues indicate that the effortful-

automatic continuum may parallel a continuum of depressed mood that is from severe to moderate to mild. Our findings support this view of parallel continuums. Although both groups of older adults with depression displayed task disability, the SLOWER patients who had significantly more depression and cognitive impairment also displayed task performance in the IADL–cognitive, IADL–physical and BADL domains that was significantly more dependent. Additionally, performance in the FM domain, representing more automatic tasks was not significantly different between the two groups.

3.4.2 Task item performance

As anticipated the greatest disparity in task performance between the SLOWER and FASTER patients occurred in IADL–cognitive task items, that is balancing a checkbook; dialing a telephone and reporting information from the call; playing bingo; and preparing bills and checks for mailing. However, there were unexpectedly few task items (n = 5) that revealed significantly different performance between the two groups. For both groups, however especially for patients with SLOWER speed of processing, there is a close similarity between tasks that were more difficult to perform and the tasks identified by Berkman et al. (1997) as being highly predictive of depression in primary care patients. In their study, tasks related to washing/bathing (e.g., bathtub/shower transfer), managing money (e.g., pay bills by check; balance a checkbook; and mail bills and checks), food preparation (e.g., use sharp utensils; stovetop use; and oven use), light housework (e.g., change bed linens; clean up after meal preparation), shopping, and using a telephone were within the top ten relative risk factors for depression. Their findings indicated that self-reporting of depression was almost five times greater if a person had difficulty managing money or doing light housework than in the absence of these difficulties. The tasks

for which the patients with SLOWER speed of processing were significantly more dependent were those with greater complexity or requiring more effortful processing. Task complexity or effort-demand is increased when the task requires greater cognitive proficiency as in the performance of IADL–cognitive tasks such as balancing a checkbook or motor proficiency and precision to maintain safety when grooming toenails. Complexity is also greater when tasks require manipulation of objects or tools such as a nail clipper, pen, checkbook, telephone, stamp, or cooking utensils. Tasks requiring simultaneous performance of multiple tasks also increase the effort-demand. Most tasks of daily living, such as balancing a checkbook, trimming toenails, or participating in a leisure activity such as bingo require concurrent subtask performance. For example, visually scanning and processing information from a completed check and transferring the information in writing using a pen to a checkbook; or maintaining your balance while manipulating clippers and judging the length to trim one's toenail; or receiving auditory information during a game of bingo, transferring the information to visually identify the appropriate letter and number on the bingo card; marking the number correctly; determining if bingo has been attained; and stating "bingo" in a raised voice. Similar to these examples, most if not all daily life tasks can be viewed as requiring concurrent or overlapping subtask performance.

The least disparity in task performance between patients with SLOWER and FASTER speed of processing occurred in functional mobility task items, that is bed, toilet, and bathtub/shower transfers; the IADL–cognitive task item use sharp utensils; and the BADL task item oral hygiene. For both groups performance of these tasks indicated a level of independence without the need for physical assistance. Similar to task domain performance, our findings of task item performance are consistent with evidence (Hartlage et al., 1993; Tancer et al., 1990;

Thomas et al., 1999) suggesting that depression interferes more with tasks requiring effortful operations (e.g., IADL–cognitive and IADL–physical) and less with tasks associated with automatic processes (e.g., FM).

Of interest is a comparison of our findings to those of Benedict, Goldstein, Dobraski, and Tannenhaus (1997) who examined the degree to which neuropsychological test performance predicts adaptive kitchen behavior in geriatric psychiatry patients. Similar to the PASS IADL–cognitive oven use task their participants were required to prepare a simple recipe of baked muffins (Kitchen Skills Assessment [KSA]). The task requires reading and following directions; selection and use of supplies and tools; measurement and preparation; and operation of an oven. Their findings indicated that participants who "failed" the KSA also had significantly slower speed of processing as measured by the TMT–B compared to those who "passed" the KSA. Similarly our findings revealed that patients with SLOWER speed of processing had greater dependence in adaptive kitchen behavior, that is IADL tasks associated with meal preparation (i.e., oven use, stovetop use, and clean up after meal preparation). These tasks were consistently easier for patients with FASTER speed of processing. Additionally, the greatest disparity (based on mean logit values) in adaptive kitchen behavior between the groups occurred for the oven use task item. Our findings add further support to the notion that independent adaptive kitchen behavior is associated with preserved performance on neuropsychological measures of speed of processing, such as the TMT–B. Therefore the speed at which a person is able to process information may be important in the performance of IADL tasks like preparing a meal.

3.4.3 Speed of processing-related disability

Because we rated task performance on a continuum, rather than dichotomously as independent or dependent, we were able to describe disability for patients with SLOWER and FASTER speed of processing in terms of the nature of task dependency in addition to disability in specific tasks. As is typical for disability measurement in rehabilitation (Centers for Medicare & Medicaid Services, 2002), we graded disability based on the type of assistance given by the examiner to overcome a performance deficit and/or to reduce a substantive risk to safety. Assistance was not provided unless a performance deficit occurred and when it was given, it was provided in a systematic order with least assistive prompts given first and more assistive prompts given as needed. In contrast to the patients with FASTER speed of processing, who only needed encouragement or nondirective (e.g., "have you missed anything?") or directive prompts (e.g., "check the calculation again"), the patients with SLOWER speed of processing also required hands-on physical guidance (e.g., examiner positioned subject's hand correctly to open the clippers, but did not support the weight of the hand), and physical support (e.g., examiner physically supported subject as she secured the sheet over the mattress) to complete tasks. Thus, as we expected, the burden associated with caregiving was greater for patients with SLOWER speed of processing.

In general, our findings supported our hypothesis that the strength of the relationship between impairment variables and disability variables would be stronger in patients with SLOWER speed of processing than those with FASTER speed of processing. Statistically significant relationships were only found for the patients with SLOWER speed of processing and for only three variables. The strongest relationship to disability was physical impairment followed by depressive symptomatology. Both variables were significantly related to all task

domains with the exception of the IADL-cognitive domain. The only other signficant relationship was found between TMT–B and the BADL task domain. Although we may agree that needing more time for processing would relate to greater dependence in task performance, we would have expected a relationship with those task domains reflecting greater effortful-demand or complexity such as in the IADL–cognitive or IADL–physical domain. The lack of relationship between the IADL domains and our speed of processing measure (i.e., TMT – B) reinforces the multi-faceted relationship between cognitive function and depression and disability. It also demonstrates the complexity of daily life tasks and the difficulty in identifying the body function(s) and degree of use required to perform a task. Although there are tasks, both in neuropsychological instruments and in daily life, that make especially high demands on speed of processing, most would agree that there are no pure measures of speed of processing. Additionally, in contrast to the findings of others (Alexopoulos et al., 1996; Steffens, Hays, & Krishman, 1999), our results did not reveal a relationship between age and disability or medical burden and disability for either group.

The intercorrelations between the task domains were consistently stronger for the patients with SLOWER speed of processing. The strongest relationship for the patients with SLOWER speed of processing, and the only significant relationship for the patients with FASTER speed of processing, emerged between the two IADL domains, confirming their similarity in task complexity. The next strongest relationship for the patients with SLOWER speed of processing was between the FM and IADL–physical domains, confirming the physical aspect of these domains. Of interest are the very weak relationships between the IADL–cognitive and BADL domains and the IADL–cognitive and FM domains for the patients with FASTER speed of processing. These findings imply that for patients who are capable of processing information

more quickly that FM and BADL tasks are more representative of automatic processing whereas for patients who require increased time to process information, although the task is the same it requires more effortful processing. That is tasks in all domains seem to be more effortful for patients with SLOWER speed of processing.

3.4.4 Disability: task item hierarchy

A primary contribution of this study in exploring performance in older adults with depression who have SLOWER and FASTER speed of processing is the identification of a hierarchy of performance tasks or indicators. This hierarchy provides a unique view of disability and the relationship between cognitive function and task disability. Our findings support those of Hartlage et al. (1993), Nebes et al. (2001), Roy-Bryne et al. (1986), Tancer et al. (1990), and Thomas et al. (1999) which show that speed of processing is a factor in older adults with depression performing effort-demanding tasks. Unlike other studies which measured performance through traditional neurospychological test tasks that are neither innate nor highly practiced, in our study we used a performance-based observational tool that measures performance of 26 daily life tasks. The tasks included in the PASS are representative of those required for community living and span the automatic-effortful processing continuum. This allows for the ordering and comparison of task performance between patients with SLOWER and FASTER speed of processing. Our findings indicate that many daily life tasks are harder for patients with SLOWER speed of processing to perform and that those tasks requiring more effortful processing, that is IADL–cognitive and IADL–physical tasks, are in general hardest for them to perform. In our sample of older adults, SLOWER speed of processing was associated with greater depressive symptomology and greater task disability however the range of ability

was broad and their performance although more dependent than patients with FASTER speed of processing does overlap. The difference in task disability suggests that intervention may be indicated: (a) when there is disability in select domains, namely IADL–cognitive and IADL–physical; (b) when performance reaches a certain level of disability, namely the need for more intrusive assistance (i.e., physical support or physical guidance, continuous demonstration, and rearrangement of tasks or task environments to enable task completion); or (c) when performance is deficit across all 4 domains (i.e., FM, BADL, IADL–cognitive, and IADL–physical). The level of assistance needed for task performance may be a significant factor in determining need for intervention to reduce the risk of increased disability. The difference in task disability between patients with SLOWER and FASTER speed of processing may also suggest that the level of task disability has the potential to be a sentinel indicator of depression and the combination of task performance and neuropsychological testing would provide a more comprehensive profile of the older adult with depression to determine and meet their health service needs.

3.4.5 Limitations

While our study allowed us to examine the impact of cognition, specifically speed of processing, on task disability, our findings should be interpreted in the context of their limitations. First, the generalizability of our results is limited by our small sample size of older adults with depression, all of whom were female and receiving services from the same academic health center. Second, our findings may be limited by the method we used to group patients by speed of processing. Although our decision to use performance on the TMT–B normative data to stratify participants by age and education was based on the tool reportedly providing information on speed of

processing it is not a pure measure for this cognitive construct. The TMT-B also provides information on visual search, scanning, mental flexibility, and executive functions. Therefore there is a possibility that the patients may have been separated into groups by cognitive functions other than speed of processing. Because of the complexity of disability, another potential limitation is our method for measuring disability. Although we assessed disability using a criterion-referenced instrument with acceptable psychometric properties there are potentially limited issues related to its use. The PASS incorporates 26 task items categorized within 4 task domains. Although each task is assigned to a domain (i.e., FM, BADL, IADL–cognitive, or IADL–physical) there may be tasks and/or subtasks of a task that cross domains. Additionally, since there is not a clear method for measuring the effort-demand of a daily life task we are unable to assign task items to a task domain based on this factor. Another issue related to our method for measuring disability is possible differences in an examiners response to a patient's speed of processing when performing a task item. Although PASS task items are presented by the examiner in a standardized manner, which include verbal instructions, placement of task objects, and progression of assistive prompts; examiners may differ in the initiation, frequency and type of assistance provided in response to a patient's SLOW or FAST processing performance which in turn may affect scoring. These issues may confound the interpretation of the relationship between depression-related disability and cognitive functioning.

3.4.6 Conclusion and recommendations

Overall, our findings suggest that speed of processing does have an impact on task disability in older adults with depression, that is, SLOWER speed of processing is associated with increased task disability especially for performance of more effortful daily life tasks. Our findings support

the need to understand better the relationship between neuropsychological test data and its relationship to task disability. Although there are a number of studies examining automatic and effortful processing in depression as measured by neuropsychological test tasks there was a need to investigate processing in depression as measured by the performance of automatic and effortful daily life tasks. Better understanding of the relationship between the neuropsychological tests routinely included in the psychiatric care of older adults and "real life" task disability is needed to devise strategies to manage disability effectively which may include the identification of sentinel tasks, both neuropsychological and performance-based.

4.0 GLOBAL OR PERFORMANCE-BASED MEASURES: DIFFERENCES IN CHARACTERIZATION OF FUNCTION IN OLDER ADULTS WITH DEPRESSION

4.1 BACKGROUND AND SIGNIFICANCE OF THE PROBLEM

Projections indicate that by 2020, the second leading cause of disability in the adult population will be major depressive disorder (Murray & Lopez, 1997). The percentage of older adults who will experience a period of depression that will negatively influence their functional performance and lead to disability is estimated to range from 30 % to 50 % (Dorfman et al., 1995; Minicuci, Maggi, Pavan, Enzi, & Crepaldi, 2002). For some older adults, disability may preclude their ability to live independently in the community. As longevity increases and the size of the older adult population expands; the burden of caring for dependent adults will also become significantly greater. Consequently, reliable and valid measures are needed to document depression-related disability and its relief following psychiatric treatment. Activities in the functional mobility (FM), basic activities of daily living (BADL), and instrumental activities of daily living (IADL) domains are commonly regarded as essential for community-based living. These domains encompass the skills needed to move from one location to another, and the tasks required for self-maintenance (i.e., bathing, dressing) and home maintenance (i.e., preparing meals, managing personal finances) respectively.

The DSM-IV (American Psychiatric Association, 1994) multiaxial assessment system is routinely used by mental health clinicians to report an individual's overall level of functioning, plan treatment, and predict outcome. Level of functioning is rated on the Global Assessment of Functioning (GAF) Scale or DSM-IV Axis V based on clinician judgment. Research indicates that the GAF Scale admission scores of most hospitalized patients fall at or below 70, of a

possible 100 points (Spitzer, Gibbon, Williams, & Endicott, 1996). Between admission and discharge GAF Scale scores change by approximately 10 to 25 points (Piersma & Boes, 1997; Kennedy, Madra, & Reddon, 1999) suggesting that the GAF Scale is sensitive to change. Although, the GAF Scale is a part of usual psychiatric care, research indicates that disability is often unrecognized in patients with psychiatric diagnoses and inadequately documented (Little, Hemsley, Volans, & Bergmann, 1986; Reuben, Valle, Hays, & Siu, 1995). Guralnik and colleagues (Guralnik, Branch, Cummings, & Curb, 1989; Guralnik, Leveille, Hirsch, Ferrucci, & Fried, 1997) identified the need to improve understanding of the complexity of disability in older adults, particularly as a factor in the high recidivism rate that is a common occurrence in psychiatric rehabilitation.

Bruce (1999) suggested that the complexity of depression-related disability might be elucidated by using different methods to examine disability. With this in mind, we sought to compare physician rated disability on the GAF Scale with performance-disability observed on the Performance Assessment of Self-Care Skills (PASS) (Rogers & Holm, 1989) in a hospitalized community-based sample of older adults further separated into subgroups by readmission status. Rasch analysis was used to create a hierarchy of task difficulty using the PASS to describe the relative difficulty of task domains and task items. Identification of relative level of difficulty of items within FM, BADL, IADL–cognitive, and IADL–physical task domains could aid in planning interventions with the aim of reducing the risk of re-hospitalization. We hypothesized that 1) there would be a moderate relationship between scores on the GAF Scale and the PASS constructs by domain at admission and discharge for both the READMIT and NON-READMIT patients and differences between admission and discharge scores on the GAF Scale would parallel the score differences on the PASS; 2) performance

disability at discharge would be greater in the READMIT patients then the NON-READMIT patients; and 3) performance disability at discharge would be greatest in the IADL–cognitive, followed by the IADL–physical, then BADL, and lastly FM in both the READMIT and NON-READMIT patients.

4.2 METHODS

This was a quasi-experimental study with patients tested before and after psychiatric intervention.

4.2.1 Participants

Patients were hospitalized on the Geriatric Clinical Research Unit (GCRU) of Western Psychiatric Institute and Clinic, Pittsburgh, Pennsylvania, now part of the University of Pittsburgh Medical Center. The inclusion criteria were: (a) consensus diagnosis of major depressive disorder (American Psychiatric Association, DSM-IV, 1994) made by the GCRU geriatric psychiatrists; (b) ≥ 60 years of age; (c) medically stable; (d) self-reported disability in at least one FM, BADL, or IADL based on the Older Adult Resources and Services (OARS) Multidimensional Functional Assessment ADL questions (Fillenbaum, 1988); (e) admitted from a community setting and expected to return to one. Patients were excluded if they had a coexisting dementia [i.e., Mini-Mental State Examination (MMSE) (Folstein, Folstein, & McHugh, 1975) score ≥ 24] or an uncorrected, auditory or visual impairment sufficiently severe to impair their ability to participate in interviewing or performance testing.

4.2.2 Procedures

All potential patients were referred to the study with their physicians' approval and all patients signed informed consent in accordance with the University of Pittsburgh Institutional Review Board requirements. Admission GAF Scale scoring was completed within 24 hours of admission as part of usual care. Performance-based testing on the PASS was conducted within 3 days of admission in the occupational therapy clinic by a research associate, trained and supervised by a licensed occupational therapist. Performance-based testing was also conducted within 3 days of discharge and the discharge GAF Scale scoring was completed within 24 hours of discharge as part of usual care. Shortly after admission and before discharge, the GAF Scale scores were subject to a consensus rating of the team of clinicians on the GCRU.

4.2.3 Instruments

Subjective judgment of disability was measured on the GAF Scale (American Psychiatric Association, DSM-III-R, 1987). The GAF Scale (see Table 4-1) is a 100-point scale used for reporting an individual's overall level of functioning on a continuum from mental health (i.e., score of 100 indicating adaptive functioning in all significant areas) to illness (i.e., score of 1 indicating complete incapacity in all areas of functioning). The scale is divided into 10-point intervals, each characterized by behavioral descriptors of symptoms and functioning. Descriptive examples of dysfunctional psychological, social, and occupational behaviors, such as "stays in bed all day" or "unable to work" are given for each interval. Inter-rater reliability (i.e., intraclass correlations) for the GAF Scale has been reported as ranging from .54 to .72 (Hall, 1995; Jones, Thornicroft, Dunn, & Coffey, 1995; Loevdahl & Friis, 1996).

Table 4-1 GAF Scale (DSM-IV, 1994)

Rating	Criteria
100 ⋮ 91	**Superior functioning in a wide range of activities, life's problems never seen to get out of hand, is sought out by others because of his or her many positive qualities, No symptoms.**
90 ⋮ 81	**Absent or minimal symptoms** (e.g., mild anxiety before an exam)**, good functioning in all areas, interested and involved in a wide range of activities, socially effective, generally satisfied with life, no more than everyday problems or concerns** (e.g., an occasional argument with family members).
80 ⋮ 71	**If symptoms are present, they are transient and expectable reactions to psychosocial stressors** (e.g., difficulty concentrating after family argument); **no more than slight impairment in social, occupational, or school functioning** (e.g., temporarily falling behind in school work).
70 ⋮ 61	**Some mild symptoms** (e.g., depressed mood and mild insomnia) **OR some difficulty in social, occupational, or school functioning** (e.g., occasional truancy, or theft within the household), **but generally functioning pretty well, has some meaningful interpersonal relationships.**
60 ⋮ 51	**Moderate symptoms** (e.g., flat affect and circumstantial speech, occasional panic attacks) **OR moderate difficulty in social, occupational, or school functioning** (e.g., few friends, conflicts with co-workers).
50 ⋮ 41	**Serious symptoms** (e.g., suicidal ideation, severe obsessional rituals, frequent shoplifting) **OR any serious impairment in social, occupational, or school functioning** (e.g., no friends, unable to keep a job).
40 ⋮ 31	**Some impairment in reality testing or communication** (e.g., speech is at times illogical, obscure, or irrelevant) **OR major impairment in several areas, such as work or school, family relations, judgment, thinking, or mood** (e.g., depressed man avoids friends, neglects family, and is unable to work; child frequently beats up younger children, is defiant at home, and failing at school).
30 ⋮ 21	**Behavior is considerably influenced by delusions or hallucinations OR serious impairment in communication or judgment** (e.g., sometimes incoherent, acts grossly inappropriately, suicidal preoccupation) **OR inability to function in almost all areas** (e.g., stays in bed all day; no job, home, or friends).
20 ⋮ 11	**Some danger of hurting self or others** (e.g., suicide attempts without clear expectation of death, frequently violent, manic excitement) **OR occasionally fails to maintain minimal personal hygiene** (e.g., smears feces) **OR gross impairment in communication** (e.g., largely incoherent or mute).
10 ⋮ 1	**Persistent danger of severely hurting self or others** (e.g., recurrent violence) **OR persistent inability to maintain minimal personal hygiene OR serious suicidal act with clear expectation of death.**
0	Inadequate information

Performance disability was rated on the PASS (Rogers & Holm, 1989). The PASS measures real time performance of 26 task situations (i.e., 5 FM, 3 BADL, 18 IADL) (see Table 4-2). The IADL task situations are classified as either IADL tasks with a greater physical component (4 IADL–physical) or IADL tasks with a greater cognitive component (14 IADL–cognitive). The examiner gives verbal instructions and presents materials and objects in a standardized manner for each task situation (Rogers & Holm, 1999; Skurla, Rogers, & Sunderland, 1988). Each PASS task situation is subdivided into critical, criterion-referenced subtasks. Dissimilar to the majority of disability measures which only rate independence, each PASS item yields 3 ratings: independence, safety, and adequacy (Rogers, Holm, Beach, Schulz, & Starz, 2001).

Table 4-2 PASS task items

Functional Mobility
Bed transfer (move from prone to supine position and rise from bed)
Stair use (ascend and descend stairs)
Toilet transfer (sit and rise from a toilet)
Bathtub/shower transfer (enter and exit tub and/or shower)
Indoor walking (walk indoors)
Basic Activities of Daily Living
Oral hygiene (clean teeth, dentures and/or mouth)
Trim toenails (groom toenails)
Dress (don and doff upper body and lower body clothing)
Instrumental Activities of Daily Living – cognitive
Shop (select and purchase grocery items)
Pay bills by check (write checks for sample utility bills)
Balance checkbook (balance a checkbook after writing checks)
Mail bills and checks (prepare envelopes for mailing checks)
Telephone use (use telephone to obtain information)
Medication management (read medication information and organize medication according to prescription)
Obtain information: auditory (obtain information from a radio announcement)
Obtain information: visual (obtain information from a newspaper)
Small repairs (repair a flashlight)
Home safety (identify and correct hazards or problems in home safety situations)
Bingo (play bingo)
Oven use (cook muffins in an oven)
Stovetop use (cook soup on a stovetop)
Use sharp utensils (cut an apple with a sharp knife)
Instrumental Activities of Daily Living – physical
Bend, lift, and carry garbage (lift and carry garbage sack)
Change bed linen (put on bed linens)
Sweep (clean spillage on the floor using a broom and a dust pan)
Clean up after meal preparation (perform clean up tasks after meal preparation)

The independence rating indicates the level of assistance (type and frequency) required to initiate, continue, and complete the task. Assistance is only provided when needed, with the least assistive prompt used first followed by progressively more assistive and intrusive prompts. The types of assistance ordered from least to most assistive are: verbal supportive, verbal non-directive, verbal directive, gestures, task/environmental rearrangement, demonstration, physical guidance, physical support, and total assistance (see Table 4-3).

Table 4-3 PASS prompt hierarchy

	LEVEL	PROMPT	DESCRIPTION
LEAST RESTRICTIVE			
VERBAL	1	Verbal support	Encouragement
	2	Verbal non-directive	Cue to alert that something is not right
	3	Verbal directive	Tell person what to do next
GESTURE	4	Gestures	Point at task object
	5	Task/environmental rearrangement	Break task down
	6	Demonstration	Assessor demonstrates/person follows
PHYSICAL	7	Physical guidance	"Hands down" – move body part into place
	8	Physical support	"Hands up" – lift body part/clothes/support
	9	Total assist	Assessor does task or subtasks for the person
MOST RESTRICTIVE			

The safety rating indicates the extent to which the task was performed in a manner that placed neither the person nor the environment at risk. The adequacy rating indicates the level of efficiency of task initiation, continuation, and completion, and the degree of match between the end product and criteria identified as acceptable quality. Each measurement construct (independence, safety, adequacy) is rated on a 4-point ordinal scale ranging from 0 (dependent, unsafe, inadequate task performance) to 3 (totally independent, totally safe, totally adequate task performance) (see Table 4-4). All 26 task items have independence and adequacy ratings however only 17 of the task items have a safety rating. The 9 task items (shop, pay bills by check, balance checkbook, mail bills and checks, telephone use, obtain information: auditory,

obtain information: visual, home safety, and bingo) that do not have a safety rating do not present a risk for immediate physical harm.

Table 4-4 PASS scoring criteria for independence, safety, and adequacy constructs

SCORE	CRITERIA		
	Independence	Safety	Adequacy
INDEPENDENT PERFORMANCE			
3	No assists given for task initiation, continuation, or completion	Safe practices are observed	Quality: acceptable (standards met) Process: subtasks performed with precision and economy of effort and action
2	No Level 7-9 assists given, but occasional Level 1-6 assists given	Minor risks were evident but no assistance provided	Quality: acceptable (standards met, but improvement possible) Process: subtasks generally performed with precision and economy of effort and action; occasional lack of efficiency, redundant or extraneous actions; no missing steps
1	No Level 9 assists given; occasional Level 7 or 8 assists given, or continuous Level 1-6 assists given	Risks to safety were observed and assistance given to prevent potential harm	Quality: marginal (standards partially met) Process: subtasks generally performed with lack of precision and/or economy of effort and action; consistent extraneous or redundant actions; steps may be missing
0	Level 9 assists given, or continuous Level 7 or 8 assists given; or unable to initiate, continue, or complete subtasks or task	Risks to safety of such severity were observed that task was stopped or taken over to prevent harm	Quality: unacceptable (standards no met) Process: Subtasks are consistently performed with lack of precision and/or economy of effort and action so that task progress is unattainable
DEPENDENT PERFORMANCE			

Inter-rater reliability was established by administering the PASS to 23 older adults representative of the following populations: well-elderly, depression, osteoarthritis,

cardiopulmonary disease, and dementia. For task independence, for the 5 FM items, raters agree for 507 of 525 observations (percent agreement 97%; average kappa 0.43); for the 3 BADL items raters agreed for 439 of 480 observations (percent agreement 91%; average kappa 0.38); for the 4 IADL–physical items raters agreed for 436 of 462 observations (percent agreement 94%; average kappa 0.43); and for the 14 IADL–cognitive items raters agreed for 1,682 of 1,805 observations (percent agreement 93%; average kappa 0.29). For task safety, for the 5 FM items, raters agreed for 87 of 105 observations (percent agreement 83%; average kappa 0.37); for the 3 BADL items raters agreed for 55 of 60 observations (percent agreement 92%; average kappa, unable to calculate); for the 4 IADL–physical items raters agreed for 76 of 83 observations (percent agreement 92%; average kappa, unable to calculate); and for the 14 IADL–cognitive items raters agreed for 92 of 105 observations (percent agreement 88%; average kappa, unable to calculate). For task adequacy, for the 5 FM items, raters agreed for 84 of 105 observations (percent agreement 80%; average kappa 0.25); for the 3 BADL items raters agreed for 54 of 63 observations (percent agreement 86%; average kappa 0.41); for the 4 IADL–physical items raters agreed for 74 of 84 observations (percent agreement 88%; average kappa 0.32); and for the 14 IADL-cognitive items raters agreed for 277 of 294 observations (percent agreement 94%; average kappa 0.65). Because the PASS is a criterion-referenced instrument the low probabilistic kappa coefficients are not remarkable (Cicchetti & Feinstein, 1990). The PASS is sensitive to change over a 6 month period (p <.001) in all task domains and constructs with the exception of the safety construct, for which there was a ceiling effect (Rogers, Holm, Mills, Desai, & Schmeler, 2005).

Exploratory factor analysis was used to investigate the unidimensionality of the PASS independence construct. We chose the commonly used approach, Cattell's scree test (Cattell,

1966), which examines the scree plot of the eigenvalues plotted against the factor numbers. The 26-item PASS will theoretically have 26 possible underlying factors. Each factor has an eigenvalue indicating the amount of variation in the items accounted for by each factor. Although there is no definitive limit on the plot, a scree plot is generally interpreted by examining the number of factors before the plotted line levels out or shows an "elbow." Cattell's rule is to drop all components after the one starting the elbow (Dunteman, 1989). Determining where the "elbow" begins is somewhat subjective, however if the points on the plot have a tendency to level out, these eigenvalues are usually considered close enough to zero that they can be ignored. Independence scores for the 26 task items of the PASS for 1158 subjects were examined by factor analysis using SPSS 12.0. Examination of the scree plot revealed a dominance of the first factor. The largest eigenvalue of the correlation matrix for the 26 items was 3.44 times larger than the second largest eigenvalue and accounted for over 37% of the variance. Using Cattell's scree test, examination of the PASS independence data revealed the presence of a dominant construct and therefore the assumption of unidimensionality for the Rasch model was met (Hambleton, Swaminathan, & Rogers, 1991, pp.9-10). Unidemsionality was only explored for the independence construct as self-care and IADL assessments for the older adult population typically measure the degree of ability or limitation in performing tasks. For this reason, independence was the only construct of interest in this study for Rasch analysis.

Medical burden was measured on the Cumulative Illness Rating Scale for Geriatrics (CIRS–G) (Miller & Towers, 1991; Miller et al., 1992). Affective impairment was measured with the Geriatric Depression Scale – 15 item version (GDS) (Yesavage et al., 1982-1983). The measures of cognitive impairment were the Mini-Mental State Examination (MMSE) (Folstein , Folstein, & McHugh, 1975), Modified Mini-Mental State (3MS) Examination (Teng & Chui,

1987), and Trail Making Test – A and B (TMT–A; TMT–B) (Lezak, 1983; Reitan, 1958). Physical impairment was measured with the Keitel Functional Test (KFT) (Eberl, Fasching, Rahlfs, Schleyer, & Wolf, 1976). Perceived general health status was measured on a visual analogue scale with 0 representing worst and 10 representing best health state imagined.

4.2.4 Data Analysis

Descriptive statistics were calculated using SPSS version 12.0 to describe the sociodemographics and disability data for each group (i.e., ALL, READMIT and NON-READMIT patients). Relationships among GAF Scale and PASS construct scores were examined using Pearson correlations. Independent *t*-tests were performed to investigate the magnitude and significance of differences between READMIT and NON-READMIT patient characteristics. Paired *t*-tests were performed to investigate the significance of differences within each group between scores at admission and discharge for the GAF Scale and PASS constructs (i.e., independence, safety, and adequacy) in the 4 task domains (i.e., FM, BADL, IADL–cognitive, and IADL–physical). A Bonferroni adjustment was used due to the repeated *t*-tests and intercorrelations within each task domain.

A 2 (group [READMIT, NON-READMIT]) x 2 (time [admission, discharge]) factorial design ANOVA with repeated measures across one factor was conducted to compare disability based on subjective testing (GAF Scale). Mauchly's sphericity assumption was met (i.e., the variances of differences between levels are significantly different) and therefore no adjustments were made to the ANOVA results (Field, 2000). A 2 (group [READMIT, NON-READMIT]) x 2 (time [admission, discharge]) x 3 (construct [independence, safety, adequacy]) factorial design ANOVA with repeated measures across time and construct was conducted to compare disability

based on performance-based testing (PASS). The Greenhouse-Geisser correction was employed in all *F*-tests involving main effects and interactions when the analysis revealed a violation of Mauchly's sphericity assumption.

The independence construct in the 4 task domains and the 26 task items for the READMIT and NON-READMIT patients at discharge was examined by Rasch Item Response Theory (IRT) or Rasch analysis using Winsteps version 3.55. Rasch analysis was used to transform the ordinal scale scores of the PASS into interval measures on a logarithmic scale. The transformations estimate the difficulty of the item and the ability of the person along a hierarchical "more than/less than" line of inquiry. The interval sizes are determined by the actual item and person performance probabilities detected in the data. Hierarchies of task difficulty and person ability are established using the measure on the interval or logit (log odds unit) scale. Therefore the unit intervals between locations on the item or person logit scale have a consistent value or meaning. This log transformation allows for comparison of the relative difficulty of tasks to other tasks, and for comparison of the relative ability of a person to other persons. This study used a score of zero as the midpoint of difficulty or ability. Items with more positive logit values were harder to perform while those with a more negative value were easier to perform. Persons with more positive logit values had a greater likelihood of performing tasks independently than persons with lower or negative logit values.

In an ideal situation the empirical data would be a perfect fit with the mathematical description of the Rasch model, however the data collected through clinical observation describes performance in the real world so all data deviates from the model to some extent. Item and person performance deviations from the expected model, or the fit statistics, are determined by examining the degree of error associated with each logit. The fit discrepancy is reported as

INFIT and OUTFIT. The INFIT and OUTFIT statistics each use a slightly different method for determining the fit of an item or person to the Rasch model. The INFIT statistic is an information-weighted sum which gives more weight to performances of persons closer to the item value to provide more insight into the item's performance. The OUTFIT statistic is not weighted, and therefore influenced more by outlying scores. That is, INFIT statistics are sensitive to unexpected performance close to the person's ability in contrast to OUTFIT statistics which are sensitive to unexpected performance that is farther away from the person's ability (Fortinsky, Garcia, Sheehan, Madigan, & Tullai-McGuiness, 2003). The INFIT and OUTFIT mean square errors of each item were examined for values ≤ 0.5 or ≥ 1.7 which could indicate a poor fit with the model for clinical observation tests (Linacre & Wright, 1994). For example, an INFIT or OUTFIT value of 1.7 indicates 70% more variation in the observed performance than the Rasch model predicts (Bond & Fox, 2001). An item is identified as problematic when both INFIT and OUTFIT values deviate from the model. A problematic item requires further investigation to determine if recoding is required due to unexpected observed performance or small sample sizes, or to determine if the item should to be combined with another item, removed, or left as is. The analysis of fit is essential if the interpretation of the Rasch measures is to be useful (Smith, 1998, 2000; Smith, Schumacker, & Busch, 1998; Smith & Suh, 2003).

PASS independence data for the READMIT and NON-READMIT patients was analysed together, thus placing all data on a common metric. The raw independence scores for all subtasks (n = 161 per group) of the 26 PASS task items were included in the Rasch analysis. In doing so, a logit value was obtained for each subtask. An average task item logit value was obtained by calculating the mean of the subtask logit values. The same process was used to calculate the INFIT and OUTFIT statistics for each task item, that is the mean of the subtask

INFIT values and OUTFIT values. Table 3-4 provides an example of the calculations. Task domain average logit, INFIT, and OUTFIT values were obtained by calculating the mean of respective values for the task items within the domain (i.e., FM, BADL, IADL–cognitive, and IADL–physical).

Table 4-5 Calculation of the average logit, INFIT and OUTFIT values for the IADL–cognitive shop task for the READMIT patients at discharge

Logit	INFIT	OUTFIT	Subtask #	Shop Subtask
-0.82	0.33	0.62	1	Selects all 4 items on the shopping list correctly
0.90	0.45	0.76	2	Selects the correct cash (matches receipt amount)
-0.82	1.20	2.08	3	Selects the correct coupon for the matching item
1.17	1.20	2.85	4	Reaches for and gathers toilet paper
2.92	1.46	3.35	5	Places toilet paper
0.67	0.93	1.93	Average values for Shop Task Item	

4.3 RESULTS

4.3.1 Participant characteristics

Table 4-6 reports sociodemographic, and pathology and impairment data for the 58 patients. The typical patient was a 73 year old widowed Caucasian female, with at least a high school education, who lived alone. Medical burden (CIRS-G) was low to moderate; depressive symptomatology (GDS) was moderate; no dementia was evident (scores of ≥ 24 on the MMSE; ≥ 78 on the 3MS); information processing speed was slow (TMT–A; TMT–B); physical

impairment (KFT) was low to moderate; and perceived health status was low. Approximately 26% (n = 15) of the patients had a hospital readmission within 12 months of discharge. Of the READMIT patients 40% had a readmission within 3 months and approximately 87% within 6 months. The average length of hospitalization for the NON-READMIT patients was approximately 32 days with these patients being hospitalized for an average of 5 days longer than the READMIT patients. There were no statistically significant sociodemographic, pathology, or impairment differences between the READMIT and NON-READMIT patients.

Table 4-6 Characteristics of all patients and by readmission status

	ALL (N = 58)	READMITS (n = 15)	NON-READMITS (n = 43)		Significance
	M (CI)	*M* (CI)	*M* (CI)	*t*, FET[a]	*p*
Sociodemographic variables					
Age, years	73.03 (71.24, 74.83)	73.60 (69.73, 77.47)	72.84 (70.74, 74.94)	-0.37	.717
Gender (% female)	86.20	86.70	86.00	0.01[a]	1.000
Race (% Caucasian)	93.10	100.00	90.70	1.50[a]	.564
Education (% ≥ high school)	55.10	59.90	53.40	0.35[a]	.765
Marital status (% widowed)	62.10	73.30	58.10	1.09[a]	.365
Living status (% lives alone)	48.30	53.30	46.50	0.21[a]	.767
Length of hospitalization, days	30.69 (26.74, 34.64)	26.80 (20.59, 33.01)	32.05 (27.12, 36.98)	1.39	.175
Pathology and impairment variables					
CIRS-G Scores range 0 to 56	11.53 (10.46, 12.61)	10.60 (8.00, 13.20)	11.86 (10.66, 13.06)	0.94	.360
GDS Scores range 0 to 15	7.87 (6.77, 8.98)	9.43 (7.09, 11.77)	7.34 (6.07, 8.61)	-1.67	.109
MMSE Scores range 0 to 30	26.63 (25.86, 27.40)	26.93 (25.37, 28.49)	26.53 (25.61, 27.46)	-0.46	.649
3MS Scores range 0 to 100	88.47 (86.29, 90.66)	87.71 (82.33, 93.09)	88.73 (86.20, 91.17)	0.37	.717
TMT–A Scores in seconds	265.57 (-72.18, 603.31)	111.85 (73.28, 150.41)	315.52 (-135.66, 766.71)	0.91	.368
TMT–B Scores in seconds	231.04 (192.81, 269.27)	313.67 (212.90, 414.43)	202.71 (-165.78, 239.65)	-2.25	.040
KFT Scores range 4 to 100	30.44 (25.74, 35.13)	33.57 (24.66, 42.49)	29.37 (23.68, 35.06)	-0.84	.408
Perceived health status Scores range 0 to 10	4.47 (3.62, 5.31)	3.40 (1.86, 4.94)	4.84 (3.82, 5.85)	1.63	.111

Note. CIRS–G = Cumulative Illness Rating Scale for Geriatrics; GDS = Geriatric Depression Scale; MMSE = Mini-Mental State Exam; 3MS = Modified Mini-Mental State; TMT–A = Trail Making Test – A; TMT–B = Trail Making Test – B; KFT = Keitel Functional Test.
> impairment = higher scores (CIRS–G; GDS; TMT–A; TMT–B; KFT); > impairment = lower scores (MMSE; 3MS; perceived health status).
FET[a] = Fishers exact test for Pearson Chi-Square.
No statistically significant differences between the READMIT and NON-READMIT patients.

4.3.2 Disability

4.3.2.1 Factors related to disability

For the READMIT and NON-READMIT patients, no significant relationships were found between the GAF Scale and PASS construct scores within any of the task domains at either admission or discharge (see Table 4-7).

Table 4-7 Relationships among GAF and PASS scores for admission and discharge

	READMITS (n = 15)		NON-READMITS (n = 43)	
	Admission	Discharge	Admission	Discharge
	GAF	GAF	GAF	GAF
PASS				
FM				
Independence	0.26	0.61	-0.19	0.17
Safety	0.35	0.26	0.26	0.25
Adequacy	0.31	0.62	-0.06	0.23
BADL				
Independence	0.26	0.07	-0.21	0.01
Safety	0.14	-0.31	-0.09	-0.32
Adequacy	0.34	0.17	-0.16	0.43
IADL–C				
Independence	-0.05	0.21	0.02	0.23
Safety	0.22	-0.07	-0.15	0.11
Adequacy	-0.05	0.27	0.01	0.18
IADL–P				
Independence	0.22	0.47	-0.14	0.29
Safety	0.16	0.32	-0.21	0.19
Adequacy	0.24	0.45	-0.15	0.30

Note. FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical. None of the correlations were statistically significant.

A 2 (group) X 2 (time) ANOVA (see Table 4-8) with repeated measures on one factor (time), revealed a significant main effect only for time, F (1.00, 56.00) = 23.37, $p \leq .01$. There was no interaction between the factors (group X time).

Table 4-8 Analysis of variance for effects of group and time on disability (global) based on subjective testing (GAF Scale)

Source	*df*	SS	MS	*F*	*p*
Between subjects					
Group	1.00	129.02	129.02	0.59	.444
Error (between)	56.00	12153.68	217.03		
Within subjects					
Time	1.00	3738.65	3738.65	23.37	<.001**
Group X Time	1.00	23.82	23.82	0.15	.701
Error (within)	56.00	8958.40	159.97		

Note. $^{**}p \leq .01$.

Separate 2 (group) X 2 (time) X 3 (construct) mixed factor ANOVA with repeated measures on the time and construct factors was conducted for the FM, BADL, IADL–cognitive, and IADL–physical domains (see Table 4-9). For all domains, the ANOVAs revealed a significant ($p \leq .01$) effect only for construct and there was no significant interaction between the factors (group X time; construct X group; time X construct) nor was there for group X time X construct.

Table 4-9 Analysis of variance for effects of group and time on disability (FM, BADL, IADL–cognitive, and IADL–physical) based on performance testing (PASS)

Source	*Df*	SS	MS	*F*	*p*
FM					
Between subjects					
Group	1.00	0.50	0.50	0.80	.376
Error (between)	53.00	33.06	0.62		
Within subjects					
Time	1.00	0.39	0.39	1.62	.209
Group X Time	1.00	0.01	0.01	0.01	.917
Error (within)	53.00	12.80	0.24		
Construct	1.57	8.67	5.54	55.28	<.001**
Construct X Group	1.57	0.27	0.17	1.71	.193
Error (within)	82.94	8.32	0.10		
Time X Construct	1.67	0.17	0.01	0.19	.784
Group X Time X Construct	1.67	0.01	0.01	0.03	.954
Error (within)	88.60	4.50	0.05		
BADL					
Between subjects					
Group	1.00	1.03	1.03	1.81	.184
Error (between)	54.00	30.57	0.57		
Within subjects					
Time	1.00	0.01	0.01	0.01	.955
Group X Time	1.00	0.29	0.29	1.06	.308
Error (within)	54.00	14.82	0.27		
Construct	1.44	31.38	21.80	93.18	<.001**
Construct X Group	1.44	0.07	0.05	0.21	.736
Error (within)	77.72	18.19	0.23		
Time X Construct	1.54	0.22	0.14	1.17	.305
Time X Construct X Group	1.54	0.12	0.08	0.62	.498
Error (within)	82.89	10.21	0.12		

Table 4-9 (continued)

IADL–C					
Between subjects					
Group	1.00	1346.47	1346.47	0.38	.539
Error (between)	50.00	24.33	0.49		
Within subjects					
Time	1.00	0.28	0.28	1.80	.186
Group X Time	1.00	0.01	0.01	0.03	.874
Error (within)	50.00	7.91	0.16		
Construct	1.18	30.65	25.97	100.96	<.001**
Construct X Group	1.18	0.14	0.12	0.47	.528
Error (within)	59.03	15.18	0.26		
Time X Construct	1.27	0.11	0.09	1.08	.320
Time X Construct X Group	1.27	0.01	0.01	0.02	.931
Error (within)	63.36	5.24	0.08		
IADL–P					
Between subjects					
Group	1.00	0.02	0.02	0.02	.897
Error (between)	49.00	47.94	0.98		
Within subjects					
Time	1.00	0.38	0.38	1.12	.295
Group X Time	1.00	0.01	0.01	0.00	.992
Error (within)	49.00	16.59	0.34		
Construct	1.30	25.45	19.62	60.10	<.001**
Construct X Group	1.30	0.05	0.04	0.13	.788
Error (within)	63.54	20.75	0.33		
Time X Construct	1.50	0.06	0.04	0.30	.680
Time X Construct X Group	1.50	0.11	0.08	0.55	.530
Error (within)	73.55	10.04	0.14		

Note. FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical **$p \leq .01$.

Post hoc pairwise comparisons based on the Bonferroni method were performed because the main effect for construct was significant. The analysis revealed that the independence, safety, and adequacy constructs tested significantly ($p = \leq .01$) different aspects of performance for the BADL, IADL–cognitive, and IADL–physical domains. For the FM domain, the independence and adequacy constructs were significantly different, as were the safety and adequacy constructs however the independence and safety constructs appeared to overlap ($p = .543$).

4.3.2.2 Global and task domain performance

Tables 4-10 and 4-11 report the GAF Scale and PASS scores at admission and discharge for the READMIT and NON-READMIT patients. Overall level of functioning, based on clinician judgment using a global measure (GAF Scale) was significantly better ($p < .01$) at discharge for both the READMIT (see Table 4-10) and NON-READMIT (see Table 4-10) patients. For the NON-READMIT patients, level of functioning, based on performance testing (PASS), improved, that is all mean performance scores for task domain independence, safety, and adequacy increased (see Table 4-11). In contrast, for the READMIT patients over 40% of the mean performance scores decreased, reflecting increased disability at discharge (see Table 4-10). Decreased performance at discharge was reflected in the BADL, IADL–cognitive, and IADL–physical task domains in the measurement constructs of independence (BADL and IADL–physical) and adequacy (BADL, IADL–cognitive, and IADL–physical). For the READMIT patients, FM was the only task domain that mean performance scores increased from admission to discharge in all constructs (independence, safety, and adequacy) and safety was the only construct that scores increased for all task domains (FM, BADL, IADL–cognitive, and IADL–

physical). Although, the mean performance scores revealed change between admission and discharge, none of the differences were statistically significant for either the READMIT (see Table 4-10) or NON-READMIT (see Table 4-11) patients.

Table 4-10 Differences between admission and discharge GAF and PASS scores for READMIT patients (n = 15)

	Admission	Discharge	*t*-test	Significance
	M (CI)	*M* (CI)	*t*	*p*
GAF Scale				
	54.47 (46.13, 62.80)	68.47 (64.24, 72.69)	-3.33	.01**
PASS				
FM				
Independence	2.43 (1.98, 2.87)	2.58 (2.30, 2.86)	-0.91	.381
Safety	2.72 (2.52, 2.91)	2.82 (2.72, 2.93)	-0.91	.381
Adequacy	2.09 (1.65, 2.53)	2.23 (2.89, 2.57)	-0.97	.349
BADL				
Independence	2.42 (2.13, 2.71)	2.37 (2.11, 2.64)	0.53	.603
Safety	2.81 (2.57, 3.05)	2.82 (2.64, 3.01)	-0.08	.935
Adequacy	2.02 (1.80, 2.25)	1.84 (1.57, 2.12)	1.84	.088
IADL–C				
Independence	2.27 (1.86, 2.68)	2.28 (1.83, 2.74)	1.84	.949
Safety	2.83 (2.68, 2.97)	2.84 (2.62, 3.07)	-0.13	.898
Adequacy	1.75 (1.40, 2.10)	1.73 (1.35, 2.11)	0.16	.877
IADL–P				
Independence	2.14 (1.54, 2.73)	2.04 (1.44, 2.65)	0.36	.725
Safety	2.83 (2.66, 2.99)	2.92 (2.76, 3.09)	-2.28	.043
Adequacy	1.78 (1.25, 2.32)	1.65 (1.10, 2.20)	0.55	.591

Note. FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical
**$p \leq .001$ before Bonferroni adjustment.

Table 4-11 Differences between admission and discharge GAF and PASS scores for NON-READMIT patients ($n = 43$)

	Admission	Discharge	*t*-test	Significance
	M (CI)	*M* (CI)	*t*	*p*
GAF Scale				
	53.09 (48.40, 57.78)	65.02 (60.94, 69.10)	-4.25	.01**
PASS				
FM				
Independence	2.61 (2.37, 2.84)	2.75 (2.61, 2.88)	-1.55	.129
Safety	2.71 (2.55, 2.86)	2.81 (2.75, 2.88)	-1.30	.200
Adequacy	2.25 (2.02, 2.49)	2.40 (2.24, 2.55)	-1.59	.120
BADL				
Independence	2.32 (2.07, 2.57)	2.53 (2.35, 2.71)	-1.90	.065
Safety	2.90 (2.83, 2.97)	2.92 (2.85, 3.01)	-0.47	.639
Adequacy	2.00 (1.76, 2.24)	2.07 (1.88, 2.25)	-0.52	.603
IADL–C				
Independence	2.17 (1.94, 2.40)	2.36 (2.17, 2.55)	-2.16	.037
Safety	2.76 (2.66, 2.85)	2.79 (2.70, 2.89)	-0.32	.750
Adequacy	1.76 (1.56, 1.97)	1.86 (1.69, 2.03)	-1.18	.246
IADL–P				
Independence	2.17 (1.88, 2.46)	2.33 (2.07, 2.60)	-1.44	.157
Safety	2.83 (2.73, 2.94)	2.91 (2.83, 2.99)	-1.26	.214
Adequacy	1.83 (1.57, 2.09)	2.00 (1.75, 2.24)	-1.50	.142

Note. FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical.
**$p \leq .001$ before Bonferroni adjustment.

For both groups, the majority (83.33%) of mean scores at admission (see Tables 4-10 and 4-11) were at a performance level (i.e., score ≥ 2.00) (see Table 4-4 for PASS construct scoring criteria) indicating that participants required: occasional demonstration, rearrangement of task or environment, gestures, verbal directives, verbal non-directives, and/or verbal encouragement (see Table 4-3 for PASS prompt hierarchy). At discharge, 91.67% of the mean performance scores for the NON-READMIT patients were ≥ 2.0 whereas for the READMIT patients only 75.00% of their mean performance scores were at this level. For both groups, mean scores at a performance level (i.e., score < 2.00) indicating that patients required: occasional demonstration, rearrangement of task or environment, gestures, verbal directives, verbal non-directives, and/or encouragement were only within the adequacy construct at both admission and discharge. For the NON-READMIT patients the lowest mean performance score was for task adequacy in the IADL–cognitive domain (M = 1.76) at admission. In contrast, the lowest mean performance score for the READMIT patients was at discharge for task adequacy in the IADL–physical domain (M = 1.65). The READMIT patients next lowest mean performance score was for task adequacy in the IADL–cognitive domain (M = 1.73) which was again at discharge.

For the NON-READMIT patients, 50% of the mean performance scores were higher than and one was equal to those of the READMIT patients at admission and 75% of the scores were higher at discharge (see Tables 4-10 and 4-11). There was not a notable pattern of PASS construct score differences between the patients and although the mean performance scores revealed differences between the READMIT and NON-READMIT patients, the differences were not statistically significant.

4.3.2.3 Fitting PASS data to the Rasch model

The independence construct (i.e., PASS independence task item scores), was examined using Rasch analysis. Tables 4-12 and 4-13 summarize the INFIT and OUTFIT statistics for the 4 PASS task domains for the READMIT and NON-READMIT patients for admission and discharge respectively. As previously stated, items with both INFIT and OUTFIT mean square values of ≤ 0.5 or ≥ 1.7 are considered problematic for clinical observation tests (Bond & Fox, 2001). Although one domain at admission (IADL–physical for the READMIT patients) and two domains at discharge (BADL for the READMIT patients; FM for the NON-READMIT patients) have OUTFIT mean square values of ≤ 0.5 or ≥ 1.7 none of the domains had INFIT mean square values outside of the suggested level. Therefore the goodness-of-fit statistics for task domains indicated that all task domains demonstrated acceptable goodness-of-fit to the model.

Table 4-12 Rasch measures of difficulty by PASS task domains for READMIT and NON-READMIT patients for admission

Average Logit	Average INFIT MNSQ	Average OUTFIT MNSQ	Task Domain
HARDEST			**HARDEST**
0.74	0.76	0.50	**IADL–P**
0.44	1.03	1.00	*IADL–P*
0.35	1.16	1.28	*IADL-C*
0.03	0.91	0.88	**IADL-C**
0.00 MEAN			
-0.49	1.23	1.65	*BADL*
-0.88	1.75	1.21	**FM**
-1.91	1.02	1.22	**BADL**
-2.08	1.12	0.87	*FM*
EASIEST			**EASIEST**

Note. READMITS = **Bold** (n = 15); NON-READMITS = *Italics* (n = 43); FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical.

Table 4-13 Rasch measures of difficulty by PASS task domains for READMIT and NON-READMIT patients for discharge

Average Logit	Average INFIT MNSQ	Average OUTFIT MNSQ	Task Domain
HARDEST			**HARDEST**
1.42	0.82	0.59	**IADL–P**
0.33	0.91	0.62	*IADL–P*
0.29	0.80	0.84	**IADL-C**
0.26	1.02	0.89	*IADL-C*
0.00 MEAN			
-0.72	1.42	1.90	*BADL*
-0.77	1.66	3.20	**BADL**
-2.48	1.24	0.98	**FM**
-2.59	1.30	1.86	*FM*
EASIEST			**EASIEST**

Note. READMITS = **Bold** (*n* = 15); NON-READMITS = *Italics* (*n* = 43); FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical.

Tables 4-14 and 4-15 summarize the INFIT and OUTFIT statistics for the 26 PASS task items for the READMIT and NON-READMIT patients for admission and discharge respectively. Three admission task items for the NON-READMIT patients (i.e., obtain information: visual [IADL–cognitive]; obtain information: auditory [IADL–cognitive]; and oral hygiene [BADL]) and one admission task item for the READMIT patients (i.e., stair use [FM]) required inspection due to both INFIT and OUTFIT mean square values ≥ 1.7 (see Table 4-14). Similarly, five discharge task items required inspection due to high fit statistics (see Table 4-15). The problematic discharge task items included the trim toenails (BADL) and stair use (FM) task

items for both groups and the oral hygiene (BADL) task item for the READMIT patients. Inspection of the problematic items will be reviewed by domain in order of difficulty beginning with the most difficult problematic item at admission (i.e., obtain information: visual for the NON-READMIT patients) and continuing through all subsequent problematic items within that domain (i.e., IADL–cognitive) for admission followed by items at discharge. Then the next most difficult problematic item will be examined in the same sequence.

Table 4-14 Rasch measures of difficulty by PASS task items for READMIT and NON-READMIT patients for admission

Average Logit	Average INFIT MNSQ	Average OUTFIT MNSQ	PASS Task Domain	PASS Task Item
HARDEST			**HARDEST**	**HARDEST**
2.62	1.13	0.87	**BADL**	**Trim toenails**
2.45	0.88	1.42	**FM**	**Bathtub/shower transfer**
2.14	1.16	1.00	**IADL–C**	**Balance a checkbook**
2.14	0.79	0.66	*IADL–C*	*Oven use*
2.11	0.92	0.68	**IADL–P**	**Change bed linen**
2.06	1.17	1.55	*BADL*	*Trim toenails*
2.05	1.00	1.12	*IADL–P*	*Change bed linen*
2.01	0.93	1.00	*IADL–C*	*Balance a checkbook*
1.86	0.88	0.92	**IADL–C**	**Oven use**
1.79	1.06	0.83	*IADL–P*	*Clean up after meal preparation*
1.55	0.71	0.50	*IADL–C*	*Use sharp utensils*
1.27	1.02	0.8	*IADL–C*	*Stovetop use*
1.14	0.76	9.54	**IADL–P**	**Bend, lift and carry garbage**
1.13	0.72	0.61	*IADL–C*	*Mail bills and checks*
0.92	1.00	1.13	**IADL–C**	**Shop**
0.88	0.89	0.70	*IADL–C*	*Pay bills by check*
0.63	1.01	1.08	**IADL–C**	**Mail bills and checks**
0.59	1.32	1.17	**IADL–C**	**Small repairs**
0.55	0.95	0.75	**IADL–C**	**Use sharp utensils**
0.33	1.30	2.08	*IADL–C*	*Shop*
0.28	0.58	0.38	**IADL–P**	**Clean up after meal preparation**
0.19	0.59	0.60	**IADL–C**	**Stovetop use**
0.06	1.02	0.80	**IADL–C**	**Pay bills by check**
0.00 MEAN				

Table 4-14 (continued)

-0.03	1.30	1.62	*FM*	*Bathtub/shower transfer*
-0.04	0.68	0.56	*IADL–C*	*Small repairs*
-0.10	1.70	2.36	*IADL–C*	*Obtain information: visual*
-0.13	1.69	1.57	*IADL–C*	*Bingo*
-0.24	1.25	1.07	**IADL–C**	**Obtain information: visual**
-0.45	0.73	0.67	**IADL–C**	**Obtain information: auditory**
-0.59	0.76	0.39	**IADL–P**	**Sweep**
-0.69	0.94	0.87	*IADL–P*	*Bend, lift and carry garbage*
-0.70	1.57	1.50	*IADL–C*	*Telephone use*
-0.87	1.13	1.07	*IADL–C*	*Home safety*
-0.88	1.46	1.48	*IADL–C*	*Medication management*
-1.00	0.84	0.40	**FM**	**Indoor walking**
-1.04	0.76	1.00	*BADL*	*Dress*
-1.19	0.82	0.77	**IADL–C**	**Medication management**
-1.24	0.74	0.60	**IADL–C**	**Telephone use**
-1.28	3.06	2.03	**FM**	**Stair use**
-1.40	0.59	1.19	**IADL–C**	**Home safety**
-1.40	1.11	1.16	*IADL–P*	*Sweep*
-1.64	1.71	3.09	*IADL–C*	*Obtain information: auditory*
-1.95	0.74	0.51	**IADL–C**	**Bingo**
-2.07	1.04	0.60	*FM*	*Stair use*
-2.17	1.75	1.11	**FM**	**Bed transfer**
-2.37	1.07	0.77	*FM*	*Bed transfer*
-2.40	2.23	1.09	**FM**	**Toilet transfer**
-2.48	1.77	2.39	*BADL*	*Oral hygiene*
-2.54	0.80	0.44	*FM*	*Indoor walking*
-2.78	1.08	1.18	**BADL**	**Dress**
-3.39	1.38	0.94	*FM*	*Toilet transfer*
-5.57	0.86	1.61	**BADL**	**Oral hygiene**
EASIEST			**EASIEST**	**EASIEST**

Note. READMITS = **Bold** (n = 15); NON-READMITS = *Italics* (n = 43); FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical.

Table 4-15 Rasch measures of difficulty by PASS task items for READMIT and NON-READMIT patients for discharge

Average Logit	Average INFIT MNSQ	Average OUTFIT MNSQ	PASS Task Domain	PASS Task Item
HARDEST			**HARDEST**	**HARDEST**
3.00	1.01	0.74	**IADL–C**	**Oven use**
2.75	1.93	3.06	**BADL**	**Trim toenails**
2.55	0.60	0.47	**IADL–P**	**Change bed linen**
2.54	0.68	0.58	*IADL–C*	*Oven use*
2.26	0.86	0.69	*IADL–P*	*Clean up after meal preparation*
1.74	1.94	2.71	*BADL*	*Trim toenails*
1.65	0.85	1.04	*IADL–C*	*Balance a checkbook*
1.62	0.89	0.66	*IADL–C*	*Stovetop use*
1.57	0.85	0.70	*IADL–C*	*Use sharp utensils*
1.52	1.09	0.79	**IADL–P**	**Clean up after meal preparation**
1.45	0.84	0.67	**IADL–C**	**Stovetop use**
1.38	0.80	0.72	**IADL–C**	**Balance a checkbook**
1.20	0.92	0.73	*IADL–P*	*Change bed linen*
1.16	0.83	0.52	**IADL–P**	**Bend, lift and carry garbage**
1.10	0.79	0.65	**IADL–C**	**Mail bills and checks**
0.80	1.42	1.19	**FM**	**Bathtub/shower transfer**
0.67	0.93	1.93	**IADL–C**	**Shop**
0.57	1.05	1.14	*IADL–C*	*Mail bills and checks*
0.46	0.74	0.56	**IADL–P**	**Sweep**
0.30	1.07	1.16	FM	Bathtub/shower transfer
0.28	0.78	0.72	**IADL–C**	**Medication management**
0.27	0.71	0.42	**FM**	**Indoor walking**
0.17	0.70	0.75	**IADL–C**	**Use sharp utensils**
0.13	1.26	1.74	*IADL–C*	*Shop*
0.13	1.14	0.96	*IADL–C*	*Pay bills by check*
0.07	0.57	0.67	**IADL–C**	**Small repairs**

Table 4-15 (continued)

0.00 MEAN				
-0.03	0.55	0.78	**IADL–C**	**Home safety**
-0.04	0.78	0.68	**IADL–C**	**Bingo**
-0.10	1.22	0.79	*IADL–C*	*Bingo*
-0.13	1.15	0.87	*IADL–C*	*Obtain information: visual*
-0.24	1.06	0.89	*IADL–C*	*Medication management*
-0.45	0.52	0.75	**IADL–C**	**Obtain information: auditory**
-0.59	0.47	0.84	**IADL–C**	**Obtain information: visual**
-0.69	0.99	0.71	*IADL–C*	*Small repairs*
-0.70	1.18	0.93	**IADL–C**	**Pay bills by check**
-0.87	1.27	0.97	*IADL–C*	*Telephone use*
-0.88	1.09	0.68	*IADL–P*	*Bend, lift and carry garbage*
-1.00	1.47	2.34	*BADL*	*Oral hygiene*
-1.04	0.75	0.36	*IADL–P*	*Sweep*
-1.19	0.97	0.73	*IADL–C*	*Home safety*
-1.24	0.86	0.71	*IADL–C*	*Obtain information: auditory*
-1.28	2.51	1.70	**FM**	**Stair use**
-1.40	1.27	0.87	**IADL–C**	**Telephone use**
-1.40	1.11	0.43	*FM*	*Indoor walking*
-1.64	1.97	5.05	**BADL**	**Oral hygiene**
-1.95	1.08	1.49	**BADL**	**Dress**
-2.07	0.85	0.65	*BADL*	*Dress*
-2.17	1.04	0.52	*FM*	*Toilet transfer*
-2.37	1.40	1.22	*FM*	*Bed transfer*
-2.40	1.90	5.96	*FM*	*Stair use*
-2.48	0.55	0.57	**FM**	**Toilet transfer**
-2.54	1.01	1.00	**FM**	**Bed transfer**
EASIEST			**EASIEST**	**EASIEST**

Note. READMITS = **Bold** (n = 15); NON-READMITS = *Italics* (n = 43); FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical. Double vertical lines indicate task items at comparable levels of difficulty within groups.

4.3.2.4 Inspection of PASS task items in the IADL–cognitive domain

Table 4-16 shows the INFIT and OUTFIT mean square error statistics for the NON-READMIT patients (n = 43) at admission for the two subtasks of obtain information–visual task item in the IADL–cognitive domain. The INFIT and OUTFIT mean square error values for subtask #1 exceeded 1.7, indicating an unexpected response pattern at that subtask (Bond & Fox, 2001). Although only the OUTFIT value for subtask #2 exceeded 1.7, we decided to also examine subtask #2 due to the INFIT value being 1.69. To determine if recoding, combining, or removal of items was indicated, the data for NON-READMIT patients at admission for subtasks #1 and #2 were examined and frequency statistics were calculated. For both subtasks, 30 of the 43 patients scored 3, representing independent performance of the subtask, 5 of the patients scored 2, and the remaining 8 patients scored 0, representing complete dependence (i.e., the need for total assistance to perform the subtask). Although the model may not anticipate these responses, in clinical practice performance can reflect extreme scores (i.e., total independence or total dependence). Due to the individuality of patients, clinicians know that performance can reflect any point of the continuum from disability to ability including the extremes of performance and that performance may also cluster at certain levels of independence versus being equally distributed along the continuum. Additionally, subtask #1 and subtask #2 address different aspects of performance. Subtask #1 (i.e., reporting a problem from information presented visually) reflects attention-related body function that requires sustaining attention on a specific task for a short period of time. In contrast, subtask #2 (i.e., reporting a plausible action from information presented visually) requires solving a simple problem. Furthermore, performance of these subtasks in a testing situation may be less affected by impairments associated with major depression then during performance of "real world" daily tasks requiring the range of attention-

related body functions (e.g., shifting, dividing, or sharing attention, or sustaining attention over an extended timeframe) and problem solving-related activities (e.g., solving a complex problem involving multiple and interrelated issues). A large OUTFIT mean square error can be triggered when there are little to no responses in score categories (e.g., 5 patients with a score of 2; 8 patients with a score of 0; no patients with a score of 1) which results in insufficient observations for the values to be accurately estimated (Fortinsky et al., 2003). Bond and Fox (2001) recommend combining low response categories with adjacent categories where logically or clinically relevant. J. C. Rogers and M. B. Holm (personal communication, August 10, 2005), authors of the PASS (1989) recommended that the subtasks not be combined as each reflects discrete criteria, that is subtask #1 requires or emphasizes the body function of sustaining attention and subtask #2 requires or emphasizes the activity of solving simple problems.

Table 4-16 Analysis of subtask responses for the PASS obtain information–visual task tem for NON-READMIT patients (n = 43) at admission

INFIT MNSQ	OUTFIT MNSQ	Subtask #	Obtain Information–Visual Subtask
1.71	2.42	1	Reports the problem accurately
1.69	2.29	2	Reports a plausible action for the problem

Table 4-17 shows the INFIT and OUTFIT mean square error statistics for the NON-READMIT patients at admission for the two subtasks of obtain information–auditory task item in the IADL–cognitive domain. Similar to the obtain information–visual task item, the INFIT and OUTFIT mean square error values for subtask #1 exceeded 1.7, indicating an unexpected

response pattern in that subtask (Bond & Fox, 2001). Although only the OUTFIT value for subtask #2 exceeded 1.7, we decided to also examine subtask #2 due to the INFIT value being relatively high (1.58) and that there are only two subtasks for this task item. Examination of the frequency statistics for obtain information–auditory subtasks revealed comparable findings to those of obtain information–visual subtasks. For subtask #1, 34 of the 43 patients scored 3, 5 of the patients scored 2, and the remaining 4 patients scored 0. For subtask #2, 31 of the 43 patients scored 3, 8 of the patients scored 2, 1 patient scored 1, and the remaining 3 patients scored 0. The previously stated rationale (i.e., large OUTFIT mean square error values due to insufficient observations; the variability in individual performance; and different aspects of body function and activity addressed by the subtasks) for obtain information–visual task item are applicable to the examination of obtain information–auditory task item. Therefore, the subtasks were not combined as each reflects discrete criteria which requires or emphasizes different body function (i.e., sustaining attention on a specific task for a short period of time) or activity (i.e., solving a simple problem) (J. C. Rogers & M. B. Holm, personal communication, August 10, 2005).

Table 4-17 Analysis of subtask responses for the PASS obtain information–auditory task tem for NON-READMIT patients (n = 43) at admission

INFIT MNSQ	OUTFIT MNSQ	Subtask #	Obtain Information–Auditory Subtask
1.83	2.22	1	Reports the problem accurately
1.58	3.96	2	Reports a plausible action for the problem

4.3.2.5 Inspection of PASS task items in the FM domain

The INFIT and OUTFIT mean square error statistics for the three subtasks of the stair use task item are shown in Table 4-18 for the READMIT patients at admission and Table 4-19 for both groups at discharge. Similar to the IADL–cognitive task items, the INFIT and OUTFIT mean square error values for the stair use subtasks were ≥ 1.7, indicating an unexpected response pattern at all subtasks (Bond & Fox, 2001). The only exception was the INFIT value (1.46) for subtask #3 for the NON-READMIT patients at discharge. Because this did not occur for the READMIT patients at admission nor at discharge, we examined all three subtasks. As with the IADL–cognitive task items, examination of the frequency statistics revealed little to no responses in select score categories. For the READMIT patients, 13 of the 15 patients at admission scored 3 on all subtasks, representing independent ability to ascend and descend stairs. Similarly at discharge, 12 of these patients scored 3 on subtask #1 and 13 of them scored 3 on subtasks #2 and #3. For the NON-READMIT patients at discharge, 41 of the 43 patients scored 3 on subtasks #1 and #2, and 39 scored 3 on subtask #3. The specific subtasks (i.e., ascends stairs with reciprocal gait and maintains balance; positions self on upper landing and maintains balance; and descends stairs with reciprocal gait and maintains balance) reflect movement-related activities that are well-integrated in the performance of routine daily tasks, such as stair use. Although the model may not anticipate these scores, "real" performance does reflect extremes of performance. Additionally, the stair use task item reflects automatic performance within the FM domain and the ability to ascend and descend stairs seems to be less affected by impairments associated with major depression. Therefore, in "real world" performance we anticipate a high frequency of independent scores or extremes of scores in the subtasks of a FM task, such as stair use. As with the IADL–cognitive task items, J. C. Rogers and M. B. Holm

(personal communication, August 10, 2005), recommended that the subtasks not be recoded, combined or removed as each reflects discrete criteria which requires or emphasizes different aspects or degrees of mobility-related activity.

Table 4-18 Analysis of subtask responses for the PASS stair use task item for the READMIT patients (n = 15) at admission

INFIT MNSQ	OUTFIT MNSQ	Subtask #	Stair Use Subtask
2.83	1.88	1	Ascends stairs with reciprocal gait and maintains balance
3.17	2.11	2	Positions self on upper landing appropriately and maintains balance
2.17	2.11	3	Descends stairs with reciprocal gait and maintains balance

Table 4-19 Analysis of subtask responses for the PASS stair use task item for the READMIT patients (n = 15) and NON-READMIT patients (n = 43) at discharge

INFIT MNSQ	OUTFIT MNSQ	Subtask #	Stair Use Subtask
READMITS			
2.51	1.70	1	Ascends stairs with reciprocal gait and maintains balance
2.51	1.70	2	Positions self on upper landing appropriately and maintains balance
2.51	1.70	3	Descends stairs with reciprocal gait and maintains balance
NON-READMITS			
2.12	6.45	1	Ascends stairs with reciprocal gait and maintains balance
2.12	6.45	2	Positions self on upper landing appropriately and maintains balance
1.46	4.97	3	Descends stairs with reciprocal gait and maintains balance

4.3.2.6 Inspection of PASS task items in the BADL domain

Table 4-20 shows the INFIT and OUTFIT mean square error statistics for the 4 subtasks of the trim toenails BADL task item for the READMIT and NON-READMIT patients at discharge. For the READMIT patients, subtasks #1 and #3 required examination due to an unexpected response pattern (i.e., INFIT and OUTFIT values exceeding 1.7) and for the NON-READMIT patients, subtasks #1, #2, and #3 were examined. The frequency statistics for all questionable subtasks revealed the majority of (> 53%) scores reflecting independent performance of the subtask (i.e., score = 3). Additionally, each of the subtasks requires or emphasizes different body functions and activities. Subtask #1 (i.e., positions cutting tool) requires fine hand use, that is

picking up, grasping, and manipulating a tool (toenail clippers); subtask #2 (i.e., reaches each foot and maintains balance) emphasizes mobility, that is changing and maintaining body position; and subtask #3 (uses cutting tool in a controlled manner) requires fine hand use combined with mobility, specifically maintaining body position while using the toenail clippers. Tasks requiring tool use also require higher-level cognitive functions (i.e., organization and planning, judgment, and problem-solving). If a patient had a coexisting diagnosis of diabetes and/or was taking blood thinning medications, the subtasks requiring use of the toenail clippers were not performed due to the risk of injury. Similar, to the tasks examined in the IADL–cognitive and FM domains, the subtasks of the BADL toenail trimming task item were not recoded, removed, or combined as each subtask reflects discrete criteria which requires or emphasizes different body function/activity or a combination of different degrees of body function/activity (J. C. Rogers & M. B. Holm, personal communication, August 10, 2005).

Table 4-20 Analysis of subtask responses for the PASS trim toenails task item for the READMIT patients (n = 15) and NON-READMIT patients (n = 43) at discharge

INFIT MNSQ	OUTFIT MNSQ	Subtask #	Trim Toenails Subtask
READMITS			
2.32	3.17	1	Positions cutting tool
1.50	2.19	2	Reaches each foot and maintains balance
2.39	2.97	3	Uses cutting tool in a controlled manner
1.49	3.91	4	Trims nails adequately
NON-READMITS			
2.00	2.78	1	Positions cutting tool
2.07	2.91	2	Reaches each foot and maintains balance
2.18	3.22	3	Uses cutting tool in a controlled manner
1.49	1.94	4	Trims nails adequately

Tables 4-21 and 4-22 shows the INFIT and OUTFIT mean square error statistics for the thirteen subtasks of the oral hygiene task item in the BADL domain for the NON-READMIT patients at admission and READMIT patients at discharge respectively. The oral hygiene task item differs from the majority of other PASS task items, in that it has four performance variations. Determination of a variation is dependent on individual oral hygiene factors; that is if the patient has teeth only, dentures only, dentures and teeth, or no teeth or dentures. Subtasks #1 (i.e., adjust water adequately) and #13 (i.e., turns off water faucet completely) are the only subtasks included for all variations. Subtasks #2 (i.e., manipulates toothpaste container to obtain adequate paste on brush), #3 (i.e., brushes all parts of mouth where teeth are present thoroughly),

#4 (i.e., rinses mouth or residue and spits into appropriate container), and #11 (i.e., rinses brush thoroughly) are included in variations for teeth. Subtasks #5 (i.e., manages all aspects of solution preparation adequately), #6 (removes all dentures from mouth), #7 (places dentures in solution in a controlled manner with adequate solution coverage), #8 (brushes and rinses all parts of dentures thoroughly), #9 (i.e., inserts all dentures into mouth correctly and securely), #10 (i.e., guards against damaging dentures adequately), #11 (i.e., rinses brush thoroughly), and #12 (i.e., cleans gums thoroughly) are included for dentures. And subtask #12 (i.e., cleans gums thoroughly) is used for those individuals having no teeth or dentures. The task item variations are important to consider when examining the problematic subtasks as they affect the frequency statistics as the number of patients performing a subtask varied (e.g., NON-READMIT $n = 43$, subtask #2 $n = 24$; READMIT $n = 15$, subtask #12 $n = 4$). For the NON-READMIT patients at admission, the INFIT and OUTFIT mean square error values for subtasks #2, #4, #8, and #11 had unexpected response patterns for the NON-READMIT patients (i.e., values ≤ 0.5 or ≥ 1.7) (see Table 4-21). This also occurred for subtasks #5, #6, #7, #8, #9, #10, and #11 for the READMIT patients at discharge (see Table 4-22). Subtasks #1, #4, and #13 also required examination for the READMIT patients at discharge as the INFIT and OUTFIT values for these subtasks reflect extreme scores (i.e., MIN = minimum estimated measure) that is all patients had the same score (see Table 4-20). For all the problematic subtasks there was a disproportionately higher frequency of scores reflecting independent performance (i.e., score = 3) when compared with the total number of patients for which the subtask was scored. Similar to the trim toenail subtasks, the oral hygiene subtasks require fine hand use (i.e., picking up, grasping, and manipulating tools), mobility (i.e., changing and maintaining body position), and higher-level cognitive functions (i.e., organization and planning, judgment, and problem-solving). As with

the other task items, the subtasks were not recoded, removed, or combined as each subtask reflects discrete criteria for performance of the task item (J. C. Rogers & M. B. Holm, personal communication, August 10, 2005).

Table 4-21 Analysis of subtask responses for the PASS oral hygiene task item for the NON-READMIT patients (n = 43) at admission

INFIT MNSQ	OUTFIT MNSQ	Subtask #	Oral Hygiene Subtask
1.75	0.82	1	Adjusts water adequately
2.83	6.27	2	Manipulates toothpaste container to obtain adequate paste on brush
2.05	5.01	3	Brushes all parts of mouth where teeth are present thoroughly
2.58	5.83	4	Rinses mouth of residue and spits into appropriate container
1.42	1.24	5	Manages all aspects of solution preparation adequately
1.16	0.66	6	Removes all dentures from mouth
1.22	0.65	7	Places dentures in solution in a controlled manner with adequate solution coverage
1.82	3.33	8	Brushes and rinses all parts of dentures thoroughly
1.35	0.67	9	Inserts all dentures into mouth correctly and securely
1.44	0.47	10	Guards against damaging dentures adequately
2.40	4.32	11	Rinses brush thoroughly
1.15	1.13	12	Cleans gums thoroughly
1.89	0.66	13	Turns off water faucet completely

Table 4-22 Analysis of subtask responses for the PASS oral hygiene task item for the READMIT patients (n = 15) at discharge

INFIT MNSQ	OUTFIT MNSQ	Subtask #	Oral Hygiene Subtask
MIN	MIN	1	Adjusts water adequately
0.50	0.29	2	Manipulates toothpaste container to obtain adequate paste on brush
0.51	2.97	3	Brushes all parts of mouth where teeth are present thoroughly
MIN	MIN	4	Rinses mouth of residue and spits into appropriate container
1.98	3.52	5	Manages all aspects of solution preparation adequately
2.96	9.39	6	Removes all dentures from mouth
2.39	5.07	7	Places dentures in solution in a controlled manner with adequate solution coverage
2.63	5.54	8	Brushes and rinses all parts of dentures thoroughly
2.96	9.39	9	Inserts all dentures into mouth correctly and securely
2.96	9.39	10	Guards against damaging dentures adequately
1.05	2.07	11	Rinses brush thoroughly
1.79	2.83	12	Cleans gums thoroughly
MIN	MIN	13	Turns off water faucet completely

Note. MIN = minimum estimated measure

4.3.2.7 Summary of results across task domains

The value of equating using the Rasch model is the placement of all items on the same ability metric which allows for comparison of the relative difficulty of tasks. Table 4-23 provides a side-by-side comparison of the logits of the task domains for admission and discharge for the READMIT and NON-READMIT patients. The task domains are ordered starting with the hardest task domain to the easiest task domain. The IADL–physical task domain was the hardest for the READMIT patients at admission, followed by IADL–cognitive, FM, and finally BADL. At discharge, the IADL–physical task domain remained hardest followed by the IADL–cognitive however the easier task domains reversed order that is FM followed BADL. For the NON-READMIT patients the task domain hierarchy at admission matched that at discharge; the IADL–physical task domain was the hardest, followed by IADL–cognitive, BADL, and finally FM. At admission, performance fluctuated between the groups. Performance in the IADL–physical and FM domains was more difficult for the READMIT patients than the NON-READMIT patients and IADL–cognitive and BADL domains were more difficult for the NON-READMIT patients than the READMIT patients. In contrast, at discharge, performance of the IADL–physical, IADL–cognitive, and FM task domains was more difficult for the READMIT patients than the NON-READMIT patients. The only domain that was harder at discharge for the NON-READMIT patients than the READMIT patients was BADL.

Table 4-23 Rasch measures of difficulty for PASS task domains for READMIT and NON-READMIT patients at admission and discharge

HARDEST			
READMITS (n = 15)			
Admission		Discharge	
Average Logit	PASS Task Item	Average Logit	PASS Task Item
0.74	**IADL–P**	0.82	**IADL–P**
0.03	**IADL–C**	0.29	**IADL–C**
-0.88	**FM**	-0.77	**BADL**
-1.91	**BADL**	-2.48	**FM**
EASIEST			

HARDEST			
NON-READMITS (n = 43)			
Admission		Discharge	
Average Logit	PASS Task Item	Average Logit	PASS Task Item
0.44	*IADL–P*	0.33	*IADL–P*
0.35	*IADL–C*	0.26	*IADL–C*
-0.49	*BADL*	-0.72	*BADL*
-2.08	*FM*	-2.59	*FM*
EASIEST			

Note. READMITS = **Bold**; NON-READMITS = *Italics*; FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical. Double vertical lines indicate task items at comparable levels of difficulty within groups.

4.3.2.8 Summary of results within task domains at discharge

Examination of results within task domains provides information for measuring specific function. It is also useful for assessing the extent to which each task domain is stretched within the hierarchy. An individual's level of disability at admission determines need for treatment or care and level of disability at discharge determines preparedness for re-entering the community, impact of intervention, and predicting future needs. Because we separated the sample into subgroups by readmission status we will focus on results at discharge.

The hardest task item within the FM domain for both the READMIT and NON-READMIT patients was the bathtub/shower transfer (enter and exit tub and/or shower) task (see Table 4-24). For both groups, the next hardest task was indoor walking (walk indoors). The

remaining FM tasks were ordered in different positions for the READMIT and NON-READMIT patients. For both groups, the toilet transfer (sit and rise from a toilet) task was easier than the bed transfer (move from prone to supine position and rise from bed) task. Both transfer tasks were easier than the stair use (ascends and descends stairs) task for the READMIT patients, with the bed transfer task being the easiest. In contrast the stair use task was the easiest for the NON-READMIT patients and was easier for them than both transfer tasks.

Table 4-24 Rasch measures of difficulty for FM task items for READMIT and NON-READMIT patients at discharge

HARDEST		**HARDEST**	
READMITS (*n* = 15)		NON-READMITS (*n* = 43)	
Average Logit	PASS Task Item	Average Logit	PASS Task Item
0.80	**Bathtub/shower transfer**	0.30	*Bathtub/shower transfer*
0.27	**Indoor walking**	-1.99	*Indoor walking*
-1.74	**Stair use**	-3.53	*Toilet transfer*
-5.48	**Toilet transfer**	-3.85	*Bed transfer*
-6.25	**Bed transfer**	-3.88	*Stair use*
EASIEST		**EASIEST**	

Note. READMITS = **Bold**; NON-READMITS = *Italics*; FM = Functional Mobility.

The order of BADL tasks for the READMIT and NON-READMIT patients was the same (see Table 4-25). The hardest task within the BADL domain was trim toenails (groom toenails) followed by the oral hygiene (cleaning teeth, dentures and/or mouth) task. The easiest BADL task for both groups was dress (dons and doffs upper body and lower body clothing).

Table 4-25 Rasch measures of difficulty for BADL task items for READMIT and NON-READMIT patients at discharge

HARDEST		**HARDEST**	
READMITS (*n* = 15)		NON-READMITS (*n* = 43)	
Average Logit	PASS Task Item	Average Logit	PASS Task Item
2.75	**Trim toenails**	1.74	*Trim toenails*
-2.37	**Oral hygiene**	-1.08	*Oral hygiene*
-2.68	**Dress**	-2.81	*Dress*
EASIEST		**EASIEST**	

Note. READMITS = **Bold**; NON-READMITS = *Italics*; BADL = Basic Activities of Daily Living.

The hardest IADL–cognitive task for both the READMIT and NON-READMIT patients was oven use (prepare muffins/operate an oven) and of the 14 tasks within the IADL–cognitive domain this was the only task ordered the same for both groups (see Table 4-26). Although the remaining 13 IADL–cognitive tasks were ordered differently for the READMIT patients than the NON-READMIT patients over 85% of the tasks that were either hardest or easiest for the READMIT patients were similarly hardest or easiest for the NON-READMIT patients. Medication management was the only task item that was among the harder tasks for the READMIT patients but was among the easier tasks for the NON-READMIT patients. Similarly there was one task (pay bills by check) that was among the harder tasks for the READMIT patients but was among the easier tasks for the READMIT patients. The easiest IADL–cognitive task for the READMIT patients was telephone use (dialing a telephone and reporting information from the call). In contrast the easiest task for the NON-READMIT patients was obtain information: auditory (obtain information from a radio announcement).

Table 4-26 Rasch measures of difficulty for IADL–cognitive task items for READMIT and NON-READMIT patients at discharge

HARDEST		**HARDEST**	
READMITS (*n* = 15)		NON-READMITS (*n* = 43)	
Average Logit	PASS Task Item	Average Logit	PASS Task Item
3.00	**Oven use**	2.54	*Oven use*
1.45	**Stovetop use**	1.65	*Balance a checkbook*
1.38	**Balance a checkbook**	1.62	*Stovetop use*
1.10	**Mail bills and checks**	1.57	*Use sharp utensils*
0.67	**Shop**	0.57	*Mail bills and checks*
0.28	**Medication management**	0.13	*Shop*
0.17	**Use sharp utensils**	0.13	*Pay bills by check*
0.07	**Small repairs**	-0.14	*Bingo*
-0.07	**Home safety**	-0.18	*Obtain information: visual*
-0.11	**Bingo**	-0.42	*Medication management*
-0.48	**Obtain information: auditory**	-0.63	*Small repairs*
-0.62	**Obtain information: visual**	-0.91	*Telephone use*
-0.88	**Pay bills by check**	-1.10	*Home safety*
-1.86	**Telephone use**	-1.23	*Obtain information: auditory*
EASIEST		**EASIEST**	

Note. READMITS = **Bold**; NON-READMITS = *Italics*; IADL–C = Instrumental Activities of Daily Living–cognitive. Double line = median.

The two easiest task items within the IADL–physical domain for both READMIT and NON-READMIT patients was the bend, lift and carry garbage task (lift and carry garbage sack) followed by the sweep (clean spillage on the floor using a broom and a dust pan) (see Table 4-27). The change bed linen (put on bed linens) task was the hardest task for READMIT patients followed by the clean up after meal preparation (perform clean up tasks after meal preparation)

task, however for the NON-READMIT patients these two hardest tasks were ordered in reverse positions with clean up after meal preparation being the hardest task for the NON-READMIT patients.

Table 4-27 Rasch measures of difficulty for IADL–physical task items for READMIT and NON-READMIT patients at discharge

HARDEST		**HARDEST**	
READMITS (*n* = 15)		NON-READMITS (*n* = 43)	
Average Logit	PASS Task Item	Average Logit	PASS Task Item
2.55	**Change bed linen**	2.26	*Clean up after meal preparation*
1.52	**Clean up after meal preparation**	1.20	*Change bed linen*
1.16	**Bend, lift and carry garbage**	-1.06	*Bend, lift and carry garbage*
0.46	**Sweep**	-1.08	*Sweep*
EASIEST		**EASIEST**	

Note. READMITS = **Bold**; NON-READMITS = *Italics*; IADL–P = Instrumental Activities of Daily Living–physical.

4.3.2.9 Summary of results across task items

The logit values of the task items for the READMIT patients and NON-READMIT patients at discharge are ordered in Table 4-15 starting with the hardest task item and ending with the easiest task item. Overlap of task items, or the same logit value for task items, occurred only twice. For the NON-READMIT patients the IADL–cognitive task of selects and purchases grocery items (shop; average logit = 0.13) was as difficult as the IADL–cognitive task of writing checks to pay bills (pay bills by check; average logit = 0.13); and for the READMIT patients the IADL–cognitive task of dialing a telephone and reporting information from the call (telephone

use; average logit = -1.40) was as easy as the FM task of walk indoors (indoor walking; average logit = -1.40) for the NON-READMIT patients.

The task items for the READMIT patients at discharge stratified into 23 separate levels (see Table 4-15), with the following task items at comparable levels of difficulty: bend, lift and carry garbage and mail bills and checks; medication management and indoor walking; and home safety and bingo. The task items for the NON-READMIT patients at discharge stratified into 21 separate levels (see Table 4-15), with the following task items at similar levels of difficulty: balance a checkbook and stovetop use; shop and pay bills by check; bingo and obtain information: visual; telephone use and bend, lift and carry garbage; and oral hygiene and sweep.

Tables 4-28 and 4-29 provide a side-by-side view of the task item hierarchies for READMIT and NON-READMIT patients at discharge. For the READMIT patients, oven use (IADL–cognitive) was the hardest task item for the inpatients and bed transfer (FM) was the easiest task item. Similarly for the outpatients, oven use (IADL–cognitive) was the hardest task item however in contrast, stair use (FM) was the easiest task item. For the READMIT patients, the hardest tasks to perform (i.e., task items above the mean) included 8 IADL–cognitive tasks (oven use; stovetop use; balance a checkbook; mail bills and checks; shop; medication management; use of sharp utensils; and small repairs); 4 IADL–physical tasks (change bed linens; clean up after meal preparation; bend, lift and carry garbage; and sweep); 1 BADL task (trim toenails); and 2 FM tasks (bathtub/shower transfer and indoor walking). The easiest tasks for the READMIT patients to perform (i.e., task items below the mean) included 6 IADL–cognitive tasks (home safety; bingo; obtain information: auditory; obtain information: visual; pay bills by check; and telephone use); 2 BADL tasks (oral hygiene and dress); and 3 FM tasks (stair use; toilet transfer; and bed transfer). For the NON-READMIT patients, the hardest tasks to

perform included 7 IADL–cognitive tasks (oven use; balance a checkbook; stovetop use; use of sharp utensils; mail bills and checks; shop; and pay bills by check); 2 IADL–physical task (clean up after meal preparation and change bed linens); 1 BADL task (trim toenails); and 1 FM task (bathtub/shower transfer). The easiest tasks for the NON-READMIT patients to perform included 7 IADL–cognitive tasks (bingo; obtain information: visual; medication management; small repairs; telephone use; home safety; and obtain information: auditory); 2 IADL–physical tasks (bend, lift and carry garbage and sweep); 2 BADL tasks (oral hygiene and dress); and 4 FM tasks (indoor walking; toilet transfer; bed transfer; and stair use). For the READMIT patients, approximately 58% or 15 of the 26 task items were positioned toward the difficult or hard end of the hierarchy, whereas less than 43% or 11 of the 26 task items where similarly positioned for the NON-READMIT patients.

Table 4-28 Task item hierarchy for READMIT and NON-READMIT patients at discharge

HARDEST	READMITS (n = 15)	**HARDEST**	NON-READMITS (n = 43)
PASS Task Item	PASS Task Domain	PASS Task Item	PASS Task Domain
Oven use	**IADL–C**	*Oven use*	*IADL–C*
Trim toenails	**BADL**	*Clean up after meal preparation*	*IADL–P*
Change bed linens	**IADL–P**	*Trim toenails*	*BADL*
Clean up after meal preparation	**IADL–P**	*Balance a checkbook*	*IADL–C*
Stovetop use	**IADL–C**	*Stovetop use*	*IADL–C*
Balance a checkbook	**IADL–C**	*Use of sharp utensils*	*IADL–C*
Bend, lift and carry garbage	**IADL–P**	*Change bed linens*	*IADL–P*
Mail bills and checks	**IADL–C**	*Mail bills and checks*	*IADL–C*
Bathtub/shower transfer	**FM**	*Bathtub/shower transfer*	*FM*
Shop	**IADL–C**	*Shop*	*IADL–C*
Sweep	**IADL–P**	*Pay bills by check*	*IADL–C*
Medication management	**IADL–C**	*Bingo*	*IADL–C*
Indoor walking	**FM**	*Obtain information: visual*	*IADL–C*
Use of sharp utensils	**IADL–C**	*Medication management*	*IADL–C*
Small repairs	**IADL–C**	*Small repairs*	*IADL–C*
Home safety	**IADL–C**	*Telephone use*	*IADL–C*
Bingo	**IADL–C**	*Bend, lift and carry garbage*	*IADL–P*
Obtain information: auditory	**IADL–C**	*Oral hygiene*	*BADL*
Obtain information: visual	**IADL–C**	*Sweep*	*IADL–P*
Pay bills by check	**IADL–C**	*Home safety*	*IADL–C*
Stair use	**FM**	*Obtain information: auditory*	*IADL–C*
Telephone use	**IADL–C**	*Indoor walking*	*FM*
Oral hygiene	**BADL**	*Dress*	*BADL*
Dress	**BADL**	*Toilet transfer*	*FM*
Toilet transfer	**FM**	*Bed transfer*	*FM*
Bed transfer	**FM**	*Stair use*	*FM*
EASIEST		**EASIEST**	

Note. READMITS = **Bold**; NON-READMITS = *Italics*; double line = median; bold line = mean. FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical.

Table 4-29 Task item hierarchy for READMIT and NON-READMIT patients at discharge in rank order (1 = hardest task item; 26 = easiest task item)

PASS Task Item	READMITS	NON-READMITS
FM		
Bed transfer (move from prone to supine position and rise from bed)	**26**	*25*
Stair use (ascend and descend stairs)	**21**	*26*
Toilet transfer (sit and rise from a toilet)	**25**	*24*
Bathtub/shower transfer (enter and exit tub and/or shower)	**9**	*9*
Indoor walking (walk indoors)	**13**	*22*
BADL		
Oral hygiene (clean teeth, dentures and/or mouth)	**23**	*18*
Trim toenails (groom toenails)	**2**	*3*
Dress (don and doff upper body and lower body clothing)	**24**	*23*
IADL–C		
Shop (select and purchase grocery items)	**10**	*10*
Pay bills by check (write checks for sample utility bills)	**20**	*11*
Balance checkbook (balance a checkbook after writing checks)	**6**	*4*
Mail bills and checks (prepare envelopes for mailing checks)	**8**	*8*
Telephone use (use telephone to obtain information)	**22**	*16*
Medication management (read med info / organize med according to prescription)	**12**	*14*
Obtain information: auditory (obtain information from a radio announcement)	**18**	*21*
Obtain information: visual (obtain information from a newspaper)	**19**	*13*
Small repairs (repair a flashlight)	**15**	*15*
Home safety (identify and correct hazards or problems in home safety situations)	**16**	*20*
Bingo (play bingo)	**17**	*12*
Oven use (cook muffins in an oven)	**1**	*1*
Stovetop use (cook soup on a stovetop)	**5**	*5*
Use sharp utensils (cut an apple with a sharp knife)	**14**	*6*

Table 4-29 (continued)

IADL–P		
Bend, lift, and carry garbage (lift and carry garbage sack)	**7**	*17*
Change bed linen (put on bed linens)	**3**	*7*
Sweep (clean spillage on the floor using a broom and a dust pan)	**11**	*19*
Clean up after meal preparation (perform clean up tasks after meal preparation)	**4**	*2*

Note. READMITS (n = 15) = **Bold**; NON-READMITS (n = 43) = *Italics*; FM = Functional Mobility; BADL = Basic Activities of Daily Living; IADL–C = Instrumental Activities of Daily Living–cognitive; IADL–P = Instrumental Activities of Daily Living–physical.

There was considerable similarity in the order of the task items between the READMIT and NON-READMIT patients (see Tables 4-28 and 4-29). Approximately 70% of the task items were ordered within the same half of the hierarchy for both groups (i.e., task items above the median). Six task items (oven use; stovetop use; mail bills and checks; bathtub/shower transfer; shop; and small repairs) were positioned in the same order for the READMIT and NON-READMIT patients. For both groups, approximately 80% of the task items in the harder half of the hierarchy (i.e., above the median) were within the IADL–cognitive and IADL–physical task domains. For the READMIT patients, all the tasks within the IADL–physical domain were positioned in the harder half of the hierarchy.

4.3.2.10 Summary of results for person ability at discharge

Examination of the logit values for person ability revealed that overall the ability or performance of the READMIT patients was similar to that of the NON-READMIT patients (see Figure 4-1). The mean logit value for the READMIT patients was 3.00 (SD = 2.70) and NON-READMIT patients was 3.14 (SD = 2.41). The range of ability for the READMIT patients was 9.4 logits (-2.07 to +7.33) whereas the range of ability for the NON-READMIT patients was 11.71 logits (-2.86 to 8.85). The range of ability for the NON-READMIT patients was almost 20% broader

than that of the READMIT patients. The mean logit value for inpatients and outpatients combined was 3.10 (*SD* = 2.47). Approximately 50% of the READMIT and 40% of the NON-READMIT patients' logit values indicated ability below the mean. The performance ability of the READMIT patients was not significantly different than that of the NONREADMIT patients (t = -.22, p = .829) at discharge.

BEST PERFORMANCE (ABILITY)		
Logit values for READMITS (*n* = 15)		Logit values for NON-READMITS (*n* = 43)
	9.00	
		8.85
	8.00	
7.33		*7.29*
	7.00	
6.31		*6.81; 6.13*
	6.00	
5.98		*5.94; 5.82; 5.41; 5.10; 5.07*
	5.00	
4.07; 4.40; 4.62		*4.82; 4.81; 4.67; 4.64; 4.37*
	4.00	
3.08; 3.78		*3.97; 3.95; 3.70; 3.69; 3.68; 3.53; 3.50; 3.47; 3.42; 3.20; 3.15*
	3.00	
2.12; 2.30		*2.98; 2.59; 2.50; 2.14*
	2.00	
1.02; 1.76; 1.81		*1.86; 1.80; 1.75; 1.73; 1.44; 1.22*
	1.00	
		0.48; 0.41; 0.38;
	0.00	
		-0.10; -0.52; -0.65
	-1.00	
-1.82		*-1.07*
	-2.00	
-2.07		*-2.86*
	-3.00	
WORST PERFORMANCE (ABILITY)		

Note: READMITS = **Bold**; NON-READMITS = *Italics*.

Figure 4-1 Rasch measures of performance ability on the PASS for READMIT and NON-READMIT patients at discharge

4.3.2.11 Summary of results for the medication management task

Because pharmacotherapy is the most common form of treatment for depression in older adults, and the medication management task was among the harder tasks for the READMIT patients but was among the easier tasks for the NON-READMIT patients, we further explored disability

specific to the IADL–cognitive medication management task. Table 4-30 provides an outline of the 6 subtasks of the medication management task.

Table 4-30 Subtasks for the PASS medication management task item

Subtask #	Medication Management Subtask
1	Reports next time to be taken correctly (1st medication)
2	Opens pill bottle with ease (1st medication)
3	Distributes pills from pill bottle correctly (1st medication)
4	Reports next time to be taken correctly (2nd medication)
5	Opens pill bottle with ease (2nd medication)
6	Distributes pills from pill bottle correctly (2nd medication)

Note. 1st medication is a bottle with a childproof lid; 2nd medication is a bottle with a non-childproof lid.

The READMIT patients had a lower mean performance independence construct score for the medication management task at discharge than admission reflecting greater disability or dependence when returning to the community (see Table 4-31). In contrast, the NON-READMIT patients had increased independence in medication management at discharge.

Table 4-31 Differences between admission and discharge medication management scores for the independence construct for the READMIT and NON-READMIT patients

	READMITS (n = 15)		NON-READMITS (n = 43)	
	Admission	Discharge	Admission	Discharge
	M (CI)	M (CI)	M (CI)	M (CI)
Medication Management				
Independence	2.40 (2.00, 2.80)	2.29 (1.87, 2.71)	2.42 (2.16, 2.68)	2.50 (2.26, 2.73)

When data were examined at the subtask level, the READMIT patients also had consistently lower mean performance scores on the medication management subtasks at discharge, again reflecting more dependent performance than the NON-READMIT patients (see Table 4-32). Although, the subtask mean performance scores were different, none of the differences were statistically significant. For both groups, the lowest mean performance scores were for subtasks #3 and #4 which involve distributing pills in accordance with the directions on the prescription label.

Table 4-32 Differences between the PASS independence scores for the medication management subtasks for READMIT and NON-READMIT patients at discharge

		READMITS (n = 15)	NON-READMITS (n = 43)	t-test	Significance
		M (CI)	M (CI)	t	p
Medication Management Subtasks					
#	Criteria				
1	Reports next time to be taken correctly (1st medication)	2.47 (2.00, 2.93)	2.51 (2.25, 2.77)	-0.18	.860
2	Opens pill bottle with ease (1st medication)	2.33 (1.65, 3.02)	2.74 (2.50, 2.99)	-1.21	.243
3	Distributes pills from pill bottle correctly (1st medication)	1.80 (1.32, 2.28)	2.05 (1.77, 2.32)	-0.94	.354
4	Reports next time to be taken correctly (2nd medication)	2.27 (1.69, 2.84)	2.56 (2.28, 2.84)	-0.97	.343
5	Opens pill bottle with ease (2nd medication)	2.73 (2.29, 3.18)	2.79 (2.55, 3.03)	-0.24	.811
6	Distributes pills from pill bottle correctly (2nd medication)	2.13 (1.58, 2.68)	2.33 (2.02, 2.63)	-0.65	.524

Note. 1st medication is a bottle with a childproof lid; 2nd medication is a bottle with a non-childproof lid.
No statistically significant differences between the READMIT and NON-READMIT patients.

The logit values for the subtasks of the medication management task for the READMIT and NON-READMIT patients at discharge are ordered in Table 4-33 starting with the hardest subtask and ending with the easiest subtask. For both groups, the hardest subtasks to perform were the two subtasks related to distributing pills in accordance with the directions on the prescription label. Although, the order of the remaining subtasks varied between the groups, overall subtasks related to the reporting of the next time the medication was to be taken were harder than those involving opening the pill bottles. As expected, the bottle with a childproof lid was harder to open than the bottle with a non-childproof lid for both groups. The mean logit score for the READMIT and NON-READMIT patients was 6.26 and 7.80 respectively.

Although, the mean logit scores were different, the difference was not statistically significant (t = -0.68, p = .503).

Table 4-33 Rasch measures of difficulty for medication management subtasks for READMIT and NON-READMIT patients at discharge

HARDEST	
READMITS (n = 15)	
Average Logit	Medication Management Subtask
5.35	**Distributes pills from pill bottle correctly (1st medication)**
2.64	**Distributes pills from pill bottle correctly (2nd medication)**
1.35	**Reports next time to be taken correctly (2nd medication)**
0.61	**Opens pill bottle with ease (1st medication**
-1.11	**Reports next time to be taken correctly (1st medication)**
-7.70	**Opens pill bottle will ease (2nd medication)**
EASIEST	

HARDEST	
NON-READMITS (n = 43)	
Average Logit	Medication Management Subtask
5.43	*Distributes pills from pill bottle correctly (1st medication)*
2.43	*Distributes pills from pill bottle correctly (2nd medication)*
-0.28	*Reports next time to be taken correctly (1st medication)*
-1.13	*Reports next time to be taken correctly (1st medication)*
-7.59	*Opens pill bottle with ease (1st medication*
-14.12	*Opens pill bottle will ease (2nd medication)*
EASIEST	

Note. READMITS = **Bold**; NON-READMITS = *Italics*. 1st medication is a bottle with a childproof lid; 2nd medication is a bottle with a non-childproof lid.

4.4 DISCUSSION

In this study we examined disability in older adults with depression based on a global measure (GAF Scale) and a performance-based measure (PASS). Our findings did not support our hypothesis that there would be a moderate relationship between global functional status, as rated on the GAF Scale, and disability specific functional status, as rated on the PASS, at admission

and discharge for both the READMIT and NON-READMIT patients. The data did not reveal any significant relationships between the GAF Scale and PASS construct scores within any of the task domains at either admission or discharge. Only level of functioning based on the GAF Scale was significantly better at discharge for both READMIT and NON-READMIT patients. There was no significant difference in level of functioning from admission to discharge based on the PASS. A possible explanation for the limited relationship is that although the GAF Scale and the PASS are both functional measures they differ considerably in method of administration and content. The GAF Scale is a global measure of functioning with scores based on clinician judgment whereas the PASS measures function for specific tasks with scores based on observed performance. Subjective measures often judge the patient's capability to perform a task rather than the actual performance of a task (Branch & Myers, 1987). These findings provide further support that subjective and objective methods are not interchangeable but that the interaction between and the combination of methods can be very useful in the assessment and treatment of older adults (Daltroy, Larson, Eaton, Phillips, & Liang, 1999; Guralnik, Branch, Cummings, & Curb, 1989; Guralnik, Fired, Simonsick, Kasper, & Lafferty, 1995; Kuriansky, Gurland, & Fleiss, 1976; Rueben et al., 1995). Additionally, the GAF Scale considers social, psychological, and occupational behavior with impairment in functioning due to physical limitations being excluded from the rating (DSM-IV, 1994). In contrast, task performance on the PASS is assessed holistically by addressing not only the influence of cognitive and affective impairments but also physical impairment. Another consideration is that the criteria identified for each GAF Scale score range focus primarily on social and psychological functioning and the examples of occupational functioning are only related to job maintenance and school performance. The GAF Scale does not include specifics related to performance of daily life occupations related to self-

maintenance and home and community management. This absence is particularly significant for older adults because the time consumed in job maintenance is typically replaced by the time spent in performing tasks required to maintain self and home.

4.4.1 Disability: subjective and performance

Of interest, are the findings involving task domain performance. For the READMIT patients, FM was the only task domain that the mean performance scores improved from admission to discharge in all constructs (independence, safety, and adequacy). Although no relationship emerged between the GAF Scale and the domains emphasizing functional motor performance (i.e., FM, BADL, and IADL–physical) knowledge of change in psychomotor activity may impact clinician ratings despite the GAF Scales specific exclusion of physical impairment given that GAF Scale scores were significantly better at discharge. A contributing factor may be that despite the exclusion, clinician judgment may be influenced by the change in level of physical activity the patient displays in the milieu (e.g., the patient is now observed walking and sitting in the milieu which contrasts the psychomotor retardation and isolative behavior of the patient remaining in his or her room noted at admission). The clinician may be using the patient's physical presence in an activity versus their level of participation or quality of performance in the activity to determine level of functioning. This finding gives support to issues raised by Piersma and Boes (1997) regarding the reliability and validity of the GAF Scale as an outcome measure. These include rating discrepancies due to unclear instructions, and possible elevation of discharge scores due to clinician access to admission scores as well as personal or institutional pressures to demonstrate treatment efficacy.

As hypothesized, the scores on the GAF Scale increased significantly from admission to discharge for both the READMIT and NON-READMIT patients reflecting improved functioning in social, psychological, and occupational behavior. These findings are consistent with research illustrating the use of the GAF Scale as a functional outcome measure to detect clinical change in psychiatric patients (Piersma & Boes, 1997; Calvocoressi, Libman, Vegso, McDougle, & Price, 1998) as well as psychogeriatric patients (Boyle, 1997; Kennedy et al., 1999; Mercer et al., 1999) Of interest is our finding that the mean GAF Scale discharge score for the NON-READMIT patients was lower than the mean GAF Scale discharge score for the READMIT patients. This finding is in contrast with the results of a study conducted by Monnelly (1997) who found that a greater percentage of readmitted patients had decreased functioning as rated on the GAF compared to patients who did not have a hospital readmission for at least six months. Additionally, the NON-READMIT patients' length of hospitalization was on average 5 days longer than that of the READMIT patients. Given that there were no statistical differences in pathology and impairment between the groups, it would seem intuitive to anticipate that increased GAF Scale scores would correspond with the group of patients who received more treatment (i.e., NON-READMIT patients).

We hypothesized that the scores on the PASS for the READMIT and NON-READMIT patients would be higher at discharge than admission because discharge from psychiatric treatment and return to the community would indicate improved function, and thus higher scores in independence, safety, and adequacy of performance of daily activities. Additionally, we anticipated that performance disability at discharge would be greater in the READMIT patients than the NON-READMIT patients. This was only partially supported by our findings. As with the GAF Scale, for the NON-READMIT patients PASS scores were higher on all PASS domain

scores, however, unlike the GAF Scale, improvement based on performance testing was not significantly better. Unlike the NON-READMIT patients, the READMIT patients exhibited decline in performance in the independence construct for BADL and IADL-physical and adequacy construct for BADL, IADL-cognitive, and IADL-physical. Although these declines were not statistically significant, perhaps due to the small size of this group (n=15), they warrant further exploration because they may portend increased risk for recurrence of depression sufficient to warrant re-hospitalization.

The portrait of disability presented by the PASS scores lends insight into the nature of depression-related disability. Because the PASS is a criterion referenced test, which takes into account the skills routinely performed by adults living independently, non-disabled older adults on average score above 2.70 in all domains for independence, safety, and adequacy (Rogers et al. 2001). In our depressed patients, scores of this magnitude were achieved only in regard to task safety with the exception of independence in the FM task domain for the NON-READMIT patients. Hence, in terms of independence, both the READMIT and NON-READMIT patients appeared to be somewhat more dependent in most tasks required for community living. Furthermore, as the complexity of task performance increased from fundamental movement skills to basic self-care tasks to home management responsibilities, dependency increased. Regardless of group or PASS domain, the highest scores were obtained in regard to task safety and the lowest scores were obtained for task adequacy. This suggests that in the presence of affective impairment, older adults may sacrifice task adequacy rather than task safety to maintain their independence, a tendency that was also apparent in a study by Rogers and colleagues (2001) of older women with osteoarthritis of the knee.

4.4.2 Disability: task domain hierarchy

We hypothesized that performance disability at discharge would be greatest in the IADL–cognitive domain, followed by the IADL–physical domain, then the BADL domain, and lastly the FM domain. This was only partially supported in the READMIT and NON-READMIT patients. Task domain performance for both groups followed the progression proposed by Lawton (1983) based on the hierarchical arrangement of ADL (i.e., FM and BADL) and IADL (i.e., IADL–physical and IADL–cognitive). Tasks in the FM and BADL domain lie at the easiest end of the hierarchy and tasks associated with home management and independent living in the community, that is IADL tasks, are positioned at the hardest end of the hierarchy. In this study, IADL were divided into those having a greater physical component, such as changing bed linens and clean up after meal preparation, and those with a greater cognitive component, such as using the oven during meal preparation and balancing a checkbook. Both the READMIT and NON-READMIT groups were comprised of patients with impairments and limitations necessitating more intensive and costly treatment (i.e., inpatient hospitalization). For both groups, with moderate depressive symptomotology, low to moderate physical impairment, and slower information processing speed (i.e., cognitive impairment), the IADL–physical domain was the most difficult or hardest task domain at discharge followed by the IADL–cognitive, then BADL, and finally the FM domain. This domain order raises the question whether IADL tasks with complex physical requirements, such as changing bed linens and clean up after meal preparation, demonstrated greater disability for these individuals due to their combination of affective, physical, and cognitive impairments.

4.4.3 Disability: task item hierarchy

The comparison of the task item hierarchies for the READMIT and NON-READMIT patients at discharge provide a unique view of disability. For the READMIT patients, all the IADL–physical tasks were positioned within the harder end of the hierarchy. Additionally, the READMIT patients had greater dependence in performance of the IADL–physical tasks at discharge than at admission. These findings support the recommendation of Goldman, Skodol, and Lave (1992) of a modified GAF Scale that includes the influence of physical impairments into the rating, such as the Social and Occupational Functioning Assessment Scale (SOFAS) (American Psychiatric Association, DSM-IV-TR, 2000). The purpose of the multiaxial assessment of DSM-IV-TR Axis V is to not only plan treatment but to predict outcome. The individual's overall level of functioning is reported on Axis V or the GAF Scale. DSM-IV-TR states that "in some settings" the SOFAS may be useful as it not only focuses on the individual's level of social and occupational functioning, but specifically instructs the assessor to "include impairments in functioning due to physical limitations, as well as those due to mental impairments" (DSM-IV-TR, 2000, p. 818). Although these findings do not provide an answer they do suggest that clinicians' should question if the GAF Scale sufficiently addresses the needs of older adults with depression as well as consider if geriatric psychiatry is one of the "settings" where the SOFAS may have greater utility.

There is extensive research supporting the effectiveness of pharmacological treatments for geriatric depression (Bartels et al., 2002) although poor adherence probably limits their effectiveness in the "real world." Substantial time and energy is spent prescribing, monitoring, and adjusting medications to achieve remission of symptoms during hospitalization. In contrast there seems to be limited attention to the patients' performance of self-administering their

prescribed medication. Although the patient's treatment plan typically includes outcomes related to medication, the plan is less likely to include specific measurable objectives related to developing, managing, and maintaining medication routines. The challenge is in measuring performance within the hospital milieu which places the patient in a dependent position for performance of many daily life tasks, including administering medication. Our findings revealed that the medication management task was among the harder tasks for the READMIT patients at discharge and was an easier task for the NON-READMIT patients at discharge. We anticipate disability to decrease and performance or independence to increase over the length of hospitalization and for patients to be at their highest level of functioning at discharge, indicating readiness to return to community living. The NON-READMIT patients' performance in medication management followed the anticipated course; however the READMIT patients' performance unexpectedly reflected increased disability at discharge when compared to performance at admission. Although the data did not reveal statistically significant differences, possibly due to our small sample size and the limitation of the 4-point PASS scoring criteria to detect small changes in performance, it does suggest the need to examine how performance of self-administering medication is measured with the aim to increase compliance, improve functional capacity, and prevent relapse.

4.4.4 Limitations

Our findings must be interpreted in the context of their limitations. First, the generalizability of our results may be limited by the small sample size of older adults with depression, all of whom received services from the same academic health center. Further, it was predominantly comprised of Caucasian females therefore the applicability of these findings to minority

populations is uncertain. Second, our findings may be limited by our measures of disability. It is not completely clear whether the lack of correspondence between the GAF Scale and the PASS reflect their differing methods of assessment, that is global clinical judgment versus specific performance-based items, or if the difference is due to incongruence in content; global versus task domains and constructs. The GAF Scale includes more psychosocial content which does not neatly correspond with the task domains or task items of the PASS. Additionally, for some patients there may have been a learning effect related to the PASS because patients performed the same task items at admission and discharge or motivation and attitude toward performing a previously administered task may have had an effect on performance. The degree to which the 4-point scale of the PASS is sensitive to detecting small performance changes also requires further investigation. Another limitation is the possible biases related to the GAF Scale that is discrepancy in administration based on differences in interpreting the instructions and the personal and institutional pressures to demonstrate treatment effectiveness which may inappropriately elevate discharge scores. And finally, there may be other unknown factors of the READMIT and NON-READMIT patients that created the differences in their task disability hierarchies.

4.4.5 Conclusion and recommendations

Most would agree that disability in older adults is complex (Guralnik et al., 1997) and more than one method for examining disability may be beneficial (Bruce, 1999). In clinical practice, there are many examples of the lack of concordance between subjective and objective methods of characterizing function (i.e., the health care professional really thought that the patient would be able to use the stove safely to prepare a simple meal or make a bed and was surprised to learn

otherwise). Additionally, we often attempt to determine or predict performance or level of functioning based on pathology and/or impairment data obtained using measures (e.g., GDS, MMSE, 3MS) and methods (i.e., self-report, proxy-report) common in clinical practice. Older adults with depression requiring more intensive intervention have a discrepancy between the way the person *is* and *should* be performing (Rogers & Holm, 1991). To achieve the goals of psychiatric treatment, that is remission of symptoms, prevention of relapse and recurrence, and improvement in quality of life and functional capacity (Lebowitz et al., 1997), the performance discrepancy needs to be measured and resolved. Our findings reveal that a performance discrepancy does exist for older adults with depression and support the need for reliable and valid measures to document depression-related disability to plan, implement, and evaluate the effectiveness of psychogeriatric intervention. To continue living in the community, older adults are required to not only perform the skills associated with self and home maintenance but also to combine the skills into routines which in turn are linked together into habits or patterns of daily living (Rogers & Holm, 1991). Therefore, geriatric psychiatry would benefit from measures that characterize function based on the individual patient's unique performance of skills that support those daily routines and habits.

In conclusion, our findings support the need for further and timely investigation of the GAF Scale, especially in relation to its application and utility with the older adult population. Exploration of the relationship between subjective and performance-based measures of functioning is required to elucidate the complexity of depression-related disability in older adults. The inclusion of performance-based testing of daily life tasks as a component of usual care in inpatient psychogeriatric treatment may provide a more accurate assessment of functioning when used in combination with the GAF Scale. In turn, devising strategies to

manage disability effectively may have a positive impact on the recidivism rate in geriatric psychiatry.

5.0 CONCLUSION

The purpose of this dissertation was to explore task disability in older adults with depression. The specific aims of this dissertation were to:

1) examine task disability patterns in older adults with depression.
2) examine the impact of information processing speed on task disability in older adults with depression.
3) compare methods of measuring disability in older adults with depression.

The first study examined task disability, as measured by performance, in older women with major depression being treated as inpatients or outpatients. The task disability pattern of those patients receiving more intensive and costly treatment for depression was different than that of patients receiving community-based services, that is greater disability was associated with more costly inpatient services. However, regardless of type of service (i.e., inpatient or outpatient), disability spanned all 4 task domains (Functional Mobility [FM], Basic Activities of Daily Living [BADL], Instrumental Activities of Daily Living – cognitive [IADL–cognitive], and IADL – physical [IADL–physical]). Disability was influenced by greater or lesser impairment and impairment in specific body functions. Specifically, physical impairment and difficulty performing more movement-oriented tasks emerged as factors associated with disability. Degree of task complexity also impacted disability, that is, tasks requiring greater cognitive and/or motor proficiency and/or precision, manipulation of objects, and/or navigation of the environment revealed greater disability. Level of assistance needed for task performance also emerged as a factor for hospitalization. Overall, our findings revealed that task disability is

different for older women whose depression results in inpatient versus outpatient treatment and that the range of ability is broad and overlapping indicating the need for inclusion of specific disability measures for treatment disposition. Furthermore, factors associated with the need for more intensive and costly inpatient treatment for older adults with depression include the ability to perform daily life tasks required for community living and that ability should be measured based on performance assessment at both the domain and individual task item levels.

The second study examined the impact of cognition, specifically speed of processing, on task disability in older women with depression. Patients were grouped according to their speed of processing as rated on a neuropsychological test (i.e., Trail Making Test – B [Lezak, 1983; Reitan, 1958]), using normative data to stratify them by age and education. Speed of processing was associated with severity of depression and there was a significant difference between patients with faster and slower speed of processing in task domain disability, specifically task performance for the BADL, IADL–cognitive, and IADL–physical domains. Both depression and slower speed of processing interfered more with effortful processing tasks and less with tasks requiring automatic processing. The effortful-automatic continuum paralleled a continuum of severe to mild depression with greater disparity in task disability evident at the effortful end of the continuum. Slower speed of processing was also associated with greater caregiver burden specifically the need for more hands-on physical guidance and support to complete tasks in addition to encouragement, nondirective and/or directive prompts. Disability was more strongly influenced by depressive symptomology and impairments for patients with slower speed of processing. Many daily life tasks were harder for patients with slower speed of processing to perform and tasks with increased complexity or effort-demand were hardest for them to perform. Although task disability was greater for patients with slower speed of processing there existed a

broad range of ability and performance did overlap with that of patients with faster speed of processing. Overall, cognitive function appeared to impact task disability in older adults with depression and specifically slower speed of processing appeared to be associated with increased task disability especially for performance of more effortful daily life tasks.

The third study examined disability in older adults with depression based on a clinician-rated measure (Global Assessment of Function [GAF] Scale [American Psychiatric Association, 1987]) and a performance-based measure (Performance Assessment of Self-Care Skills [PASS] [Rogers & Holm, 1989). Patients were grouped according to readmission status and disability was measured at admission and discharge. Older adults with depression sacrificed task adequacy rather than task safety to maintain their independence. Additionally, the greatest disability occurred in complex tasks with combined cognitive and physical requirements. Only disability based on the GAF Scale showed significant improvement at discharge for both patients who were and were not readmitted. Although the GAF Scale and PASS both measure disability there is a lack of concordance between the measures as the GAF appears to measure the patient's capability to perform a task whereas the PASS measures actual performance of a task. Additionally, observation of patients' physical activity may inadvertently impact clinician GAF Scale ratings despite the rating exclusion of physical limitations, therefore consideration should be given to using the modified GAF Scale that incorporates the influence of physical impairments into the rating. Overall, our findings indicate that the interaction between, and combination of, these disability measures may be most beneficial in geriatric psychiatry. Additionally, a comparison of disability at admission and discharge based on a performance-based measure may identify patients at risk for recurrence of depression sufficient to warrant re-

hospitalization. This information can assist in planning and implementing more effective psychogeriatric interventions following hospitalization.

In summary, findings from these studies suggest that for older adults with depression, ability to perform particular daily life tasks may be a factor indicating the need for inpatient hospitalization. Additionally, there may be sentinel tasks which are disability indicators and those tasks may differ based on a range of factors including speed of processing and physical impairments. Overall, our findings illustrate the complexity of depression-related disability, the lack of concordance between different methods of characterizing function, and the need for the inclusion of performance-based testing of daily life tasks as a component of usual care for older adults with depression. Further study is needed to determine if specific tasks indicate disability; examine the concordance of the PASS and the Social and Occupational Functioning Assessment Scale (American Psychiatric Association, DSM-IV-TR, 2000) in geriatric psychiatry; investigate speed of processing during performance of automatic versus effortful daily life tasks; analyze the level of difficulty of all subtasks of the PASS regardless of domain or item; and explore the efficacy of combining assessment methods in geriatric psychiatry for the prediction of discharge outcomes.

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