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MENTAL STATUS AND FUNCTIONAL BEHAVIOR
IN MALE GERIATRIC PATIENTS

by

Gregory Lee Mayer

dissertation submitted in partial fulfillment
of the requirements for the degree

of

DOCTOR OF PHILOSOPHY

in

Psychology

UTAH STATE UNIVERSITY
Logan, Utah

1989

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Gregory Lee Mayer

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ABSTRACT

Mental Status and Functional Behavior
In Male Geriatric Patients

by

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Department: Psychology

It was the goal of this study to examine the ecological validity of a number of measures of mental status for geriatric individuals. Subjects were 40 alert, ambulatory male VA patients. Mental status instruments included the Mini-Mental State Examination (MMSE), the Wechsler Memory Scale (WMS) and the Vocabulary subtest of the WAIS-R. Measures of functional behavior included the Woodcock-Johnson Scales of Independent Behavior (SIB) and the Parachek Geriatric Behavior Rating Scale (PGBRS). Significant relationships were found between the MMSE and the SIB, between the WMS and the SIB, and between the WMS and the PGBRS. It was found that estimation of functional behavior can be enhanced significantly through the use of battery of mental status instruments.

(166 pages)

CHAPTER I

INTRODUCTION AND STATEMENT OF THE PROBLEM

In many clinical geriatric settings, critical decisions regarding disposition upon discharge are based on what has become known as the patient's "mental status." It is assumed in particular that measures of attention/concentration, memory, judgment, abstract reasoning, etc. are specifically relevant to the patient's ability to return to independent functioning once discharged. A variety of assessment procedures (including psychiatric interviews, cognitive instruments and standardized mental status questionnaires) have been used to gather pertinent data. These procedures involve various degrees of formality and standardization.

Informal, unstandardized clinical approaches to the assessment of mental status are not necessarily reliable and have repeatedly been shown to lead to inconsistent and inaccurate diagnoses (Depaulo & Folstein, 1978; Klein et al., 1985). For these reasons, standardized mental status questionnaires were developed to provide an easily administered yet more standardized and normative-based alternative to the psychiatric interview (Davis & Foreyt, 1975; Nelson, Fogel, & Faust, 1986; Wang, 1981). In addition, it has been often noted that traditionally used psychometric procedures standardized on younger populations may not be appropriate for elderly

individuals. For this reason, standardized mental status assessment instruments were also designed largely to attend to a number of issues specific to geriatric assessment. These issues include fatigue, physical differences, prevalence of chronic disease, sensory deprivation, motivation factors, anxiety, test-taking set, etc.

In summarizing the usefulness and value of mental status questionnaires, Gurland (1980) concluded:

A tentative suggestion is that for most purposes the MSQ or its analogs provide the majority of information to be gained from available psychological tests with respect to assessing cognitive impairment as a basis for the detection of organic brain syndrome, the prediction of the outcome of the syndrome and the monitoring of the course of cognitive impairment over time. (p.682)

Despite such encouraging conclusions, questions regarding the validity of instruments designed to determine mental status have occurred with some regularity throughout the literature. In 1972, for example, Salzman, Kochansky and Shader stated that while any one of many local variations of mental status examinations may be helpful in diagnosis and classification, no single instrument has had sufficient testing in terms of validity. Despite a number of more recent attempts to show the validity of instruments designed to measure mental status, existing evidence in support of their use

is still minimal. This is partially because in most studies, including the most recent ones (e.g., Brink, Capri, De Neeve, Janakes, & Oliveira, 1978; Cresswell & Lanyon, 1981; Gurland, Golden, Teresi, & Challop, 1984; Haglund & Schuckit, 1976; Irving, Robinson, & McAdam, 1970; Pattie & Gilleard, 1975; Pfeffer, et al., 1981; Shader, Harmatz, & Salzman, 1974), the respective mental status measuring instruments were validated largely in terms of the psychiatric interview as criterion. The use of the psychiatric interview as a criterion was pointed out as a weakness as early as 1954:

The difficulty in using this method of validation lies, of course, in the fact that the criterion itself is in need of validation. (Yates, p. 359)

As of 1987, the same form of criticism was still being tendered regarding validation of mental status instruments (Little, Hemsley, Bergmann, Valans, & Levy, 1987).

Perhaps in response to such criticism, a number of studies have attempted to demonstrate the validity of various standardized mental status questionnaires using a variety of other criteria. One major approach to the validation of these instruments has been to determine their diagnostic concordance with other measures. For example, when used in conjunction with tests for emotionality, these tests have been shown to reliably separate dementia from depression (Gurland, Copeland,

Sharpe, & Kelleher, 1976). Studies of patient samples have demonstrated a positive association between mental status scores and long-term diagnosis (Walton, cited in Vitaliano, Breen, Albert, Russo, & Prinz, 1984).

Mental status questionnaires additionally have been shown to be correlated with a number of more complex measures of impairment including test batteries dealing with memory and learning (Zarit, Miller, & Kahn, 1978), electroencephalographic examination (EEG) (Irving, et al., 1970), and computerized tomography of the brain (Kasnick, Garron, & Fox, cited in Zarit, 1980).

Objective measures of cognitive status in community-dwelling older persons have been correlated with activity level (Klonoff & Kennedy, 1966) and with outcome of illness and increased mortality (Goldfarb, Fisch, & Gerber, 1966; Sanderson & Inglis, 1961).

One area in which validation of mental status instruments has not yet been sufficiently investigated is one which currently is beginning to receive attention in neuropsychology (e.g., Hart & Hayden, 1986), as well as gerontology: *ecological validity*, or the relationship between mental status scores and *functional behavior* (i.e., behaviors related to self-care and to social and occupational functioning). Although writers have repeatedly indicated that functional behavior is a pivotal concept with respect to case management issues including

discharge and disposition decisions, and that loss of functional behavior is an indicator of the severity and course of the underlying mental disorder (Gurland, 1980), clinicians rarely use measures of functional behavior to facilitate diagnostic and/or discharge decisions. Dementia, for example, is often diagnosed on the basis of cognitive assessment alone; behavior function is typically inferred solely on the basis of cognitive assessments (e.g., Pfeiffer, 1975; Smyner, Hofland, & Jones, 1979) or at best in conjunction with informal patient or family reports. A major problem with this procedure is that most of the instruments relate only theoretically to the actual behavioral deficits seen in dementia and have not been validated against performance outside the clinic or laboratory in relevant tasks of daily life (Crook, 1983). Surprisingly little research has been conducted supporting the inferences regarding the relationship of cognitive performance per se to functional competence (Heaton & Pendleton, 1981).

The work that *has* been conducted on the relationship of cognitive performance to specific functional competence appears to be rather equivocal. For example, Wilson, Grant, Witsey, and Kerridge (1973) found that while high scores on a mental status test (MSQ) were associated with good functional competence, low scores were not necessarily associated with poor functional competence.

Pfeffer et al. (1981) observed that social functioning is a better predictor of functional independence than are cognitive tests. In a study involving a quite small number ($N = 7$) of subjects in the early stages of Alzheimer's disease, Weintraub, Baratz, and Mesulam (1982) concluded that the extent of involvement of cognitive functions as tested in a neuropsychological evaluation may not reflect the level of a patient's functional capacity at home. Ferm (1974), in contrast, also using a patient sample, was able to demonstrate a positive association between mental status scores and subsequent ability to live independently. Gurland, Dean, Cross, and Golden (1980) found that objective measures of cognitive functioning in community-dwelling older persons were correlated with both mortality and dependency. Vitaliano et al. (1984) found that measures of memory and attention accounted for much of the impairment observed in two areas of functional competence: *maintenance* (e.g., feeding, toileting, dressing) and *higher functioning* (e.g., hobbies, writing, reading) in a sample of community-residing elderly subjects with presumed Alzheimer's disease. Hershey, Yang, and Jaffe (1985) noted a positive relationship between results of the Functional Activities Questionnaire (Pfeffer, Kurosaki, Harrah, Chance, & Filos, 1982) and placement in several diagnostic categories of dementia.

Based on these findings, it appears appropriate to conclude that it may be quite risky in a clinical situation to make inferences about functional competence of a patient based on cognitive performance alone.

It was the goal of the current study to examine the *ecological* validity of a number of measures of mental status for geriatric individuals by assessing the relationship between mental status and functional behavior. To achieve this goal, the following questions were addressed:

1. Is there a relationship between mental status and functional behavior?
2. Gurland (1980) pointed out that it is unfortunate that the usual method of analysis employed for comparing the effectiveness of psychological tests for the elderly is to examine the relative predictive or discriminant power of each test in relation to other tests. Rarely does one find that *multiple regression analysis* has been applied, so there remains uncertainty as to the contribution of each test to the predictive or discriminant power of the test battery as a whole. The current study is designed also to address this deficiency in the literature. Thus, the second question to be addressed was: Does a wide variety of clinical measures of mental status improve our

ability to estimate functional behavior? If so, what is the relative contribution that each measure makes?

It is believed that a study that provides answers to these questions will address the theoretical issue of the relationship of tests to behavior. In addition, establishing the ecological validity of a number of measures of cognitive status has significant implications for the use of such instruments in making decisions about treatment and discharge.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

In this section, issues pertinent to the evaluation of geriatric individuals are reviewed. A number of historic and theoretical threads relevant to mental status assessment are traced. The presence of informal clinical approaches to mental status assessment during the first part of this century is documented. An outline then follows of the development of brief, psychometrically based instruments, each designed to assess discrete cognitive functions. Attempts to create broader based instruments are reviewed. Various theoretical and practical issues related to this task are discussed, including: methods of data gathering (interview vs. observationally based); methods of validation; populations involved; contrasting assumptions regarding what "mental status" is and, consequently, what kinds of instruments are needed to assess it. Next, several of the most widely used contemporary instruments are described, and past attempts to document their reliability and validity are reviewed. Finally, specific attempts to investigate the relationship of mental status results and functional behavior are reviewed.

Assessment Issues in Geriatric Populations

It is becoming clear for a number of reasons that geriatric populations in some quite measurable ways are different from other populations and thus cannot necessarily be assessed (or treated) in the same manner. Geriatric subjects, as a group, vary significantly from non-geriatric ones physiologically as well as psychologically. During the aging process, widespread and heterogeneous changes may occur in a variety of functions including cognitive, sensory, motor, metabolic, autonomic, and/or endocrine function. Morphological changes have been noted such as decreased weights of kidneys, thyroid gland, testes, ovaries, uterus, liver, pancreas, skeletal muscle, increased body fat content and increased heart size. Many of these changes are detrimental to organismic adaptability and, therefore, viability. For example, the aging process is typically associated with decreases in maximal breathing capacity, cardiac output, and a lowered ability of the individual to adapt to environmental stressors (Almi, 1984). Changes in sensory acuity and in reaction time, also related to aging (Wantz & Gay, 1981), similarly change the individual's ability to adapt to environmental changes. Variations in metabolism, absorption, rate of circulation, and excretion affect the half-life and toxicity of administered drugs, as well as

their clinical effect (Eisdorfer & Stotsky, 1977; Salzman et al., 1972; Miller & Parachek, 1974). Numerous other changes secondary to the aging process have been noted. For example, differences in electroencephalographic findings are seen between geriatric and non-geriatric populations (Dustman & Snyder, 1981; Dustman, Snyder & Schlehuber, 1981). Changes in sexual response as a function of aging have been documented widely (Rockstein & Sussman, 1979; Wantz & Gay, 1981). Despite the fact that a variety of functions may be affected during the aging process, there are tremendous individual differences with respect to the pattern of functional changes displayed during aging; furthermore, the functional changes associated with aging may be displayed in a heterogenous manner within individuals. Put another way, the body does not age at the same rate (Almi, 1984).

Geriatric assessment techniques coming from two diverse orientations have, in the past, suffered from several ills: (a) Informal (i.e., unstandardized and non-normative based) clinical methods originating from the medical model have been demonstrated to be not particularly reliable or valid; (b) Formal psychometric techniques derived from procedures normed on other

populations have not been demonstrated to be valid or reliable for the elderly, and are fraught with a number of separate problems.

Specific problems pertaining to both informal and formal procedures for clinical assessment of the elderly have been clearly noted in the literature. Because the focus of the current investigation is on the evaluation of mental status in the elderly, the review that follows will focus on aspects of the geriatric assessment literature directly pertinent to mental status assessment procedures. These procedures, which involve various degrees of formality and standardization, serve to quickly gather data regarding cognitive functioning in the areas of attention/concentration, memory, judgment, abstract thought, etc.

Mental status assessment of the elderly has been used as a means of determining the presence of dementia. Unfortunately, *informal* approaches, no matter how elaborate, may provide insufficient sensitivity in diagnosing dementia (Hoffman, 1982; Horton & Wedding, 1984; Little et al., 1987). For example, a number of studies have suggested that physicians using non-standardized, informal assessment procedures frequently do not diagnose dementia until deterioration is severe (Klein et al., 1985; McCartney, 1986; Roca et al., 1982; Trzepac, Tague and Lipowski 1985; Williamson et al., 1964). In one

study (Knights & Folstein, 1977), physicians failed to identify 37% of patients shown via objective assessment methods as having cognitive deficits. Nurses failed to identify 55% while medical students failed to identify 46% of patients having cognitive deficits. Of those patients *not* identified as cognitively impaired by their physicians, 5 of 6 also showed impairment in language skills, including an inability to understand simple commands. In a separate investigation (Depaulo & Folstein, 1978), it was found that 29% of cognitive disturbance noted via assessment using the Mini-Mental State Examination (MMSE) on 129 consecutively admitted neurology inpatients went undetected by resident neurologists.

Similar findings have been noted by other investigators. For example, Benton, Van Allen, and Fogel (1964) found that a standardized orientation test disclosed impaired orientation in 27 patients with brain disease, only 13 of whom had been judged to be temporally disoriented on routine clinical examination. Hoffman (1982) reported that of 122 patients admitted with functional psychiatric diagnoses to a specialized medical-psychiatric inpatient unit, 34% were found to have organic disorders after standardized neuropsychiatric assessment. Jacobs, Bernhard, Delgado, and Strain (1977) found that almost half of the 33% of patients on a general

medical ward ultimately determined to have cognitive deficits were not initially identified via informal clinical procedures. In an earlier study, Engel and Romano (1959) reported similar findings. McCartney and Palmateer (1985) found that for 182 geriatric patients assessed within 24 hours of hospital admission, physicians did not detect cognitive deficits in 77% of those shown via objective criteria to have these.

In addition to the problem of false negatives in diagnosis, the problem of false positives has also been mentioned in the literature. For example, Knights and Folstein (1977) found that of patients scoring in the normal range of cognitive function, 8% were identified as impaired by physicians, 5% by nurses and 10% by medical students. Garcia, Reding, and Blass (1981) noted a tendency among physicians to over-diagnose dementia. They found that of 100 patients referred to a specialized outpatient dementia clinic, at least 26 were not demented. Hoffmann (1982) found that only 63% of 35 patients admitted with diagnoses of dementia to a medical-psychiatric inpatient unit retained this diagnosis after evaluation using standardized assessment procedures. It has been noted additionally that internists in training tend to over-diagnose dementia among inpatients and that poorly educated persons with limited baseline intellectual

function are most likely to be misclassified (Roca et al., 1982).

Because of consistent findings noting problems with informal clinical assessment procedures, the use of standardized data collection and interpretation procedures has been repeatedly recommended to improve reliability as well as diagnostic or predictive accuracy (Crook, 1983; Gurland, 1980; Nelson et al., 1986).

Past approaches to formal psychometric assessment of the elderly amounted basically to extrapolation of norms based on the general population or lengthy scales for establishing the status of a patient.

A summary of assessment considerations relating specifically to psychological problems of the aged can be found in Schaie and Schaie (1977) and in Gallagher, Thompson, and Levy (1980). These writers conclude that assessment efforts often suffer because of (a) factors relating to training issues, including inadequate training of psychologists for working with geriatric individuals; (b) factors relating to test construction and psychometric issues, including inadequate normative data and improper standardization, poor reliability and external validity, lack of ecological validity (in this case, meaning the relationship of measures to actual behavior in a non-test environment), ambiguous instructions, inappropriate content of items for older individuals, and inability of

tests to discriminate at lower levels of functioning; and (c) factors relating to noncognitive issues in test performance among elderly individuals, including an absence of "test-taking set" and unfamiliarity with the rationale of standardized testing, increased tendency to become fatigued, motivational difficulties, greater cautiousness (also reported by Arenberg & Robertson-Tchabo, 1977; Birren, 1968; and Pfeiffer, 1980), lower performance expectations, etc.

A review of the literature and a study conducted at a state hospital by Goga and Hambacher (1977) indicated that valid psychological test results on geriatric patients are often difficult to obtain, since many of these patients cannot undergo the standard techniques of psychological testing because of the rigors of the procedure(s) themselves, or because of the level of responsiveness required. Despite this, Goga and Hambacher report, the use of traditional psychometric measures in the assessment of both psychiatric and normal elderly persons is widespread and has staunch supporters. Their review of studies advocating the use of traditional psychometric measures (see, for example, Britton & Savage, 1966; Canter, Day, Imboden, & Cluff, 1962; Hall, Savage, Bolton, Pidwell, & Blessed, 1972; Peak, 1970; Savage, Britton, Bolton, & Hall, 1973) indicated that the users of the more traditional techniques do not regularly deal with

geriatric patients who are severely impaired, even if the degree of impairment is defined in the context of the total geriatric population.

A number of other reports indicate that formal test batteries may be difficult to administer to many elderly populations, especially, but not necessarily only, those found in institutions. Klonoff and Kennedy (1966) found that 52% of a hospital sample to be used in their study were not testable for unspecified reasons. Fisher and Pierce (1967) found a large number of of untestable elderly people in community samples. Comparable findings were reported by a number of other investigators (Irving et al., 1970; Meer & Baker, 1966; Pattie & Gilleard, 1975).

Others have criticized the use of standard psychological assessment procedures with geriatric patients on similar grounds (e.g., Birren, 1968; Crook, 1979; Kramer & Jarvik, 1979; Miller & Parachek, 1974; Schaie, 1978; Schaie & Schaie, 1977; Taylor & Bloom, 1974).

Other potentially contaminating factors particularly associated with geriatric populations that are not necessarily accounted for in the use of traditional assessment procedures include:

1. The effects of sensory deprivation, including:
 - (a) The incidence of visual problems, some of

which cannot be corrected by glasses. This may affect test results and their interpretation (Kaplan, 1979). In addition, poor orientation, a decreased ability to read, and occasional frightening visual impressions, all due to vision losses, may complicate communication in the testing process (Pfeiffer, 1980).

(b) Hearing loss, which is a widespread problem among the elderly (Weinstein & Amsel, 1986).

(c) The effects of environmental deprivation associated with institutionalization and/or reduced ability to move out of the home (Erber, 1979; Lieberman, 1969).

2. The problem of remoteness of test material from the daily life of the elderly (Kaplan, 1979).
3. (Related to number two, above) The effects of cohort-specific factors such as education and occupational and ability levels (Gallagher et al., 1980).
4. Anxiety, which is already at a high level in many elderly individuals. The increased stress of a testing situation may lead to intense arousal, thus impairing the person's ability to function effectively (Pfeiffer, 1980).
5. The frequency of chronic illnesses in elderly populations, which may often preclude the use of

traditional psychometric batteries in evaluating older people. In addition, since chronic illnesses are prevalent in elderly people, their comfort and the security of their health may depend heavily upon receiving good *medical* care, and long and rigorous *psychological* testing may be viewed by them as a threat in that it can be seen as a deliberate minimization of the physical nature of their symptoms (Gurland, 1980).

Kahn and Miller (1978), summarizing the literature relating to psychometric assessment of the elderly, indicated that many reports have indicated that the standard psychometric tests cannot even be administered to more than a *minority* of elderly patients because of a variety of factors such as physical condition, cultural limitations, lack of motivation, or extent of psychological pathology. They concluded that many of the tests reported as effective for research purposes or for evaluating younger people appear to be quite limited for clinical use with the aged.

Summary: Assessment Issues in Geriatric Populations

Informal clinical assessment approaches are fraught with reliability and validity problems. Traditional psychometric approaches applied to the elderly suffer from problems associated with inadequate norming and

standardization, poor reliability and external validity, inappropriate content of items for older individuals, and inability of tests to discriminate at lower levels of functioning. In addition, numerous other factors specific to the geriatric population have not consistently been considered in the development of psychometric instruments. These factors include greater tendency to fatigue, general physical differences, the greater prevalence of chronic, debilitating disease, the presence and effects of sensory deprivation, changes in motivation, increased anxiety and cautiousness, lack of necessary test-taking set, etc.

Given the numerous problems associated with psychological assessment of geriatric populations, and considering that some of these problems may be exacerbated in the assessment of individuals suspected of dementia, standardized instruments had to be developed to provide easily administered, quick, reliable, and valid alternatives to questionable previous assessment procedures. The review of the literature presented in this paper describes attempts to develop mental status instruments which meet the above criteria for appropriateness for geriatric populations. As the reader will note, although many of the issues have been addressed, a number remain, particularly issues pertaining to the ecological validity of such measures.

Early History of
Mental Status Assessment

Procedures designed to determine the "mental status" of patients have been in the clinical armamentarium for years. For example, Israel Wechsler (1939) described a number of tests of orientation and memory which may be employed while gathering information for the anamnesis. Few specifics were offered, and standardization or normative considerations were clearly not emphasized.

Hinton and Withers (1971) provide a brief summary and early history of a number of "clinical tests of the sensorium." According to these authors, many contemporary tests are based on early work by such investigators as Babcock (1930) (general information; reversed days of the week; tests of orientation), Hayman (1941) (serial sevens), Ruesch (1944) (serial sevens), Shapiro, Post, Lofving and Inglis (1956) (address test; serial sevens; story repetition). Hinton and Withers state that a number of such tests have been shown to have value in differentiating organic from functional mental disorders, though many are of little use, concluding, "the tests which have become grouped together as the clinical tests of the sensorium are a motley assembly, apparently sustained by habit rather than by any consistent process of standardization and validation" (p. 12).

It would appear that clinicians working with institutionalized psychiatric patients were among the first to combine various "tests of the sensorium" and other items to create screening instruments designed to assess overall mental status. "Mental status", as conceptualized by these workers, probably would be best translated as "psychiatric status", a description of the patient's current condition in a wide range of areas (well beyond merely cognitive) based on behaviors observed or inferred during the anamnesis. How these workers conceptualized the nature of mental status assessment and subsequent decisions regarding instrument construction and assessment procedures likely occurred as a function of situationally based assessment needs.

For example, one early attempt to develop a rating device which would "meaningfully portray the behavior of psychotic patients in a ward environment" (Rowell, 1951, p.255) was the Psychiatric Behavior Scale. This scale was developed in response to the need to track the cognitive, affective and behavioral progress of psychiatric patients and to allow such evaluation to be conducted on a regular basis by nursing staff. In addition to the issue of staff training, the issue of patient cooperation, or the possible lack of it, appeared to influence the construction of this instrument: The Psychiatric Behavior Scale was a non-diagnostic, observational procedure which

was to be used in determining the current level of functioning of psychiatric patients. It offered a staff rating scale which did not require participation or cooperation from the patient. This gave it an administrative advantage over other more traditional procedures. Twenty 'behaviors' were selected after careful examination of standard texts on psychiatry for descriptive terminology. These selected behaviors covered such areas as affect displayed, apparent presence of hallucinations, orientation, quality of thought, motor activity, and attitude toward the staff. The behaviors were used to construct item scales with five discriminators each, describing various behavior intensities ordinarily seen among psychiatric patients.

Test-retest (intra-nurse) and inter-rater (inter-nurse) reliability were ascertained with favorable results ($r = .95$; $r = .85$ respectively). Psychiatrist ratings and psychiatrist rankings in terms of degree of deviance from society were used as validity criteria, also with favorable results: $r = .78$ for nurse-psychiatrist judgments; $r = .81$ for rankings of instrument scores and psychiatrist rankings.

Based on the findings of this study, the author concluded that psychotic behavior could be recorded numerically and that this numerical recording yielded information which may facilitate a better understanding of

the patient (Rowell, 1951). He presented a graphically illustrated case study to demonstrate the use of the scale to interpret, predict and review one patient's illness as she proceeded through an extended course of "electrical stimulation" (p. 259).

Though the Psychiatric Behavior Rating Scale had advantages, it also had major weaknesses. It was, for example, perhaps excessively subjective in that it did not deal completely with measurable behaviors, but rather with somewhat vague constructs (e.g., mood, affect, orientation) which had to be inferred from observations of the patient. Furthermore, the Likert-type continua which were presented for rating of each characteristic on the scale were not always well-defined or operationalized. Nor were the points on the continua standardized from one criterion to the other. In addition, the scale was not standardized on a large group of people and so would prove to have no diagnostic utility. Finally, since it was not developed for elderly population, its usefulness in the provision of services for this population was limited. (For further criticism of this scale, see Lorr, 1954).

Based also on the need to assess overall "psychiatric status", though not designed to be completed solely on the basis of observationally-derived data, a number of semi-structured interviewed schedules were developed with

the aim of improving item reliability and diagnostic consistency over non-structured procedures.

One early semi-structured interview was the Present State Examination (PSE) developed by Wing, Birley, Cooper, Graham, and Isaacs (1967). This interview consisted of a comprehensive series of specific questions, but allowed a great deal of freedom in further questioning to permit the interviewer to ascertain to his/her satisfaction if a symptom was present. Another early semi-structured interview was the Mental Status Schedule (MSS) (Spitzer, Fleiss, Burdock, & Hardesty, 1964). These interview schedules were similar in that both allowed considerable latitude in interview procedures; neither emphasized standardization of assessment procedures or norming of results. Finally, both were designed to assess overall "psychiatric status"; neither schedules provided adequate coverage of "cognitive status" per se (Gurland et al., 1976).

Another instrument designed to assess "psychiatric status", the Mental Status Examination Record (MSER) (Spitzer & Endicott, 1971), also allowed the rater to make numerical judgments of impairment in various areas relating to psychiatric status. In this case, the ratings were to be based upon the interviewer's own technique which, of course, would vary widely, depending upon the training, philosophical orientation, and personality of

the rater. The MSER was a four-page instrument available on optical scan forms to facilitate computer usage. Its coverage was divided into the following sections:

1. Attitude toward rater.
2. Reliability and completeness of information.
3. Appearance.
4. Motor behavior.
5. General attitude and behavior.
6. Mood and affect.
7. Quality and content of speech and thought.
8. Somatic functioning and concern.
9. Perception.
10. Sensorium (orientation, recent and remote memory, clouding of consciousness, dissociation, etc.).
11. Judgment.
12. Potential for suicide or violence.
13. Insight and attitude toward illness.
14. Overall severity of illness.
15. Change in condition during the past week.

To facilitate reliability, definitions were provided for all technical terms as well as non-technical terms which were not self-evident. To maximize the ability to discriminate between patients who exhibit different degrees of traits noted on the forms, most of the items were scaled to indicate intensity or severity. The authors did not rigidly adhere to this, however. Some items, such as echolalia, neologisms, and amnesia were simply noted if they were present. Other items were scaled on a 5 point unipolar scale of severity from '1 = none' to '5 = marked'. A few scales were bipolar. For example, energy level was scaled 'very low', 'low', 'normal', 'very energetic', 'extremely energetic'.

The MSER appeared to have a number of advantages. Since its use allowed any number of procedures for gathering information, the issue of patient cooperativeness was less salient. In addition, the authors reported that the MSER appeared to be quite helpful as a training device for clinical staff. They also cited the possible usefulness of automated forms such as the MSER in clinical research.

Unfortunately, a number of weaknesses also marked the MSER. No efforts to systematically assess its reliability were reported. This is especially important given the fact that no standardized assessment procedures were advocated. As with the Psychiatric Behavior Scale (Rowell, 1951), the MSER dealt with a number of vague constructs, though it did offer improvements in tying these to measurable behaviors. In addition, the authors reported that the MSER required an elaborate system of editing to detect missing information, poor erasures, incorrect identification of data, and improper ratings because of failure to read instructions. Finally, for the purposes of its relevance to this paper, the MSER was not standardized on a geriatric population. In summary, then, the MSER remained merely a method of systematically organizing data gathered via informal clinical assessment procedures. As such, however, it was an improvement over

less systematic procedures because it could reduce omissions in the data gathering process.

In addition to the influence of issues pertaining to patient cooperativeness, one can trace the influence of time/manpower considerations in the development of "psychiatric status" instruments. For example, Rackow, Napoli, Kleganoff, and Schillinger (1953), citing the great pressure of work and the limited numbers of trained personnel, and finding themselves in a specific clinical situations which involved the transfer and reassessment of 2,000 psychiatric patients, stressed the desirability of having a personality evaluation technique that would provide rapid screening of chronic psychiatric patients. Based upon these considerations, they developed a group procedure that would not only enable them to rapidly evaluate large numbers of patients, but also could be used on a regular basis to monitor their progress and thus evaluate the effectiveness of therapy programs.

A review by Rackow et al. (1953) of the then-available literature regarding personality rating scales did not offer much to the solution of the problem, since most scales were administered individually and thus consumed a great deal of time. The authors thus developed their own rating scale of seven criteria which were derived from a review of the literature. These criteria were felt to indicate the important aspects of the

personality of the chronic psychiatric patient in a mental hospital population and as such would be the factors to be evaluated in planning and prescribing an integrated treatment program for such patients. The seven criteria were as follows:

1. Reality Testing.
2. Emotionality.
3. Communication.
4. Human Relationships.
5. Aspirations.
6. Manifest Overt Behavior.
7. Intellectual Functioning.

The authors reported attempts to be precise in the definition of each criterion so that the raters would be accurate in their evaluation. A likert-type scale was used to indicate level of functioning for each criteria. Hospital placement and treatment for each patient was to be largely based on his score. The rating scale was not used, however, in certain groups of patients whose place in the hospital would be automatically determined because of homicidal or suicidal tendencies, physical disabilities, incontinence, or elopement tendency.

The ratings were performed during group sessions, each one occurring one week apart and each run by a separate dyad of therapists (a psychiatrist and a psychologist in each). The second session was seen primarily as being the means of corroborating the results of the first. During these structured sessions, 10

questions were asked, each patient answering each question in rotation.

The 10 structured questions were as follows:

1. What is your name?
2. How old are you?
3. Do you know the name of this hospital?
4. How long have you been in this hospital?
5. Tell us why you came to this hospital.
6. Tell us how you spent your day in the hospital.
7. Do you like it here? Tell us more. Go on...
8. Do you like going to the movies and parties we have here?
9. What are you going to do when you leave the hospital?
10. What do you think you will be doing a year from now?

A group atmosphere was encouraged by the raters in an attempt to facilitate evaluation of the current level of socialization of the individual patients.

In all, 100 chronic male psychiatric patients were rated by the method described and a statistical evaluation of the results was conducted. The interteam reliability as measured by the Pearson product moment coefficient was .77. A comparison of the team rating with the rating of each patient by his psychiatrist was used to test for validity. The coefficient for validity (team-one/psychiatrist; team-two/psychiatrist respectively) were .71 and .70.

The authors concluded that this particular procedure for screening of chronic psychiatric patients was reliable and valid. They stated that it was preferable to an

individual method in that it permitted more rapid screening of a greater number of patients . In addition, they asserted that it would permit the evaluation of social and interpersonal adjustment. Finally, they suggested that the scale could be of prognostic value since it could be used to effectively evaluate patients on a continuous basis and thus give feedback about the relative efficacy of treatment procedures.

The drawbacks of this early attempt to systematically evaluate patients would seem obvious. As in Rowell's (1951) Psychiatric Behavior Scale, and to a lesser extent in the MSER (Spitzer & Endicott, 1971), ratings of behaviors were used to generate measures of ill-defined constructs. Possible criticisms regarding the operationalization and validity of the Likert-type continua were not addressed. Also, the Rackow scale may be criticized on the grounds that features specific to group administration (e.g., development of a response set during administration; subsequent discussion and rehearsal among patients) may affect its validity. Individually administered instruments may be much more resistant to these threats to validity, though some authors are not convinced that they are immune absolutely (Keating, 1987).

An interesting alternative attempt to combine both interview and observational procedures in a "psychiatric status" scale was developed by Rockland and Pollin (1965)

(RP Scale). Refined and renamed (Quantified Mental Status Scale) by Salzman et al., (1972), this scale quantified psychiatric status into 16 continua, grouped into three general categories: General Appearance and Manner; Affect and Mood; Content of Thought and Thought Processes. The scale involved rating only observable phenomena; a minimum of inference was necessary in the scoring process, thus avoiding criticism that was leveled against earlier scales such as the Psychiatric Behavior Scale (Rowell, 1951). On each continuum, the zero point represented normalcy; psychopathology in both plus and minus directions was represented by larger negative and positive values.

The scale was designed to be used repeatedly by psychiatrists after a 30 to 60 minute unstructured clinical interview. In keeping with the expected use of the scale as a repeated criterion measure for change due to reversal/deterioration of patient symptomatology, rate-rerate (test-retest) and interrater reliability were assessed. Rate-rerate consistency appeared to be acceptable in terms of total whole scale scores and in terms of behaviors on the continuum below normalcy ($r = .97$ and $.83$ respectively), but not in terms of behaviors on the continuum above normalcy ($r = .47$, n.s.). Interrater reliability was quite variable for individual items, but was acceptable for whole scale positive, negative, and total scores ($p > .05$).

The authors suggested a variety of uses for the scale scores, the most meaningful being the use of the whole scale scores as a quantitative measure of "psychoticism", to compare one patient with another, and to evaluate the patient's level of functioning over time. No investigations designed to demonstrate the validity of this have been found. In addition, the PR has not been tested on geriatric populations, nor have there been studies which suggest its suitability for assessing degree of organicity (Salzman et al., 1972). Thus, its usefulness in assessing mental status in geriatric populations appears limited.

The Geriatric Mental Status Interview (GMS) (Gurland, Copeland, Sharpe, & Kelleher, 1976; Copeland, Kelleher, Duckworth, & Smith, 1976) was designed to address these issues. The GMS also was a semi-structured interview schedule which included items designed specifically to discriminate between organic and functional disorders. In contrast to the previous semi-structured interview schedules, however, the authors appeared to be more invested in the advantages of standardization and were more specific about administration procedures. The development of the GMS was based largely on a previous schedule used for younger psychiatric patients, using 500 items drawn from the PSE developed by Wing et al. (1967) and 200 items drawn from the MSS developed by Spitzer et

al. (1964). In addition, since items useful for assessment of cognitive impairment were not well represented in the previous instruments, items were included from the Mental Status Questionnaire (MSQ) (Kahn, Goldfarb, Pollack, & Peck, 1960) and from the Face-Hand Test (Fink, Green, & Bender, 1952). Unfortunately, despite the authors' clearly stated understanding of the need to reduce test time for geriatric populations, the resulting scale was practically as unwieldy as those that spawned it: 100 routine questions were presented plus an additional 100 questions if necessary for follow-up query. Overall, nearly 500 items were scored on the basis of interview information. The scale took approximately one hour to administer and require a highly trained interviewer. This length, of course, relates to the task the GMS was designed to accomplish, that is, the assessment of overall "psychiatric status".

A number of reliability measures were reported for the GMS. These varied as a function of item type and as a function of conditions of assessment. In general, reliability of individual self-report and test items was acceptable (mean value for interviewer-observer comparisons was .80 and .51 for interviewer--re-interviewer comparisons). For items requiring inference based on observations, the reliability values were much lower (.36 for interviewer--observer

comparisons; .29 for interviewer--re-interviewer comparisons). Perhaps of greater importance in the context of this discussion is the fact that this instrument was designed largely to provide for geriatric inpatients diagnostic conclusions across a wide range of psychopathology. Attempts to substantiate the reliability of the GMS for overall diagnosis met with mixed success.

Assumptions Regarding the Construct "Mental Status"

That the Geriatric Mental Status Interview (GSM) was developed despite the fact that a much briefer instrument for the evaluation of geriatric mental status was already available at the time (Mental Status Questionnaire, or MSQ), suggests that two separate lines of reasoning were emerging regarding formal mental status assessment. It is possible that these lines of reasoning were based on separate ideas regarding how "mental status" was to be operationalized. One line of reasoning (represented by the GMS) remained in the main stream of psychiatric assessment in which "mental status" included all the traditional psychiatric areas of functioning (i.e., "psychiatric status"). Instruments designed to assess "mental status" from this point of view had to be broad-based, and were expected to lead toward psychiatric diagnoses. The other line of reasoning appears ultimately to have been peculiarly tied to differential diagnostic

issues pertinent to the assessment of geriatric populations (e.g., organic vs. functional issues). The result was an emphasis on measures of discrete areas of functioning (e.g., cognitive status) to the exclusion of other areas found in traditional psychiatric assessment. Due to the fragile nature of the population to be assessed, instruments had to be as brief and non-threatening as possible. Hence, the rise of instruments designed to be initial "screening" devices.

We will now trace the development of instruments more fully in the second tradition, since these are directly pertinent to the current study.

By eliminating diagnostic conclusions expressed in terms of vague constructs as inferred through behavioral observations, later investigators attempted to increase the validity of their instruments. In general, this was accomplished in one of two ways: (a) via *direct interview* involving standardized questions directed to the patient; (b) by *observation* of specifically stated, operationally defined discrete units of behavior without making inferences about internal constructs in the subject.

The direct interview approach was the direction that later mental status examination instruments would typically take (cf. Berg & Svensson, 1980; Copeland et al., 1976; Folstein, Folstein, & McHugh, 1975; Haddad & Coffman, 1987; Hodkinson, 1972; Irving et al., 1970; Kahn

et al., 1960; Lawson, Rodenburg, & Dykes, 1977; Mattis, 1976; Pattie & Gilleard, 1975; Pfeiffer, 1975; Whelihan, Leshner, Kleban, & Granick, 1984). Within the interview framework, the investigator was able to begin to address validity issues using carefully chosen standardized questions and basing scores on normative procedures. The testability problem was then dealt with by severely reducing the length of the instrument (e.g., Kahn et al., 1960) while carefully validating the shortened version against the longer original versions. Reducing administration time not only made the scale more likely to be used both clinically and in research, it made the scale more likely to be used with geriatric populations.

Test construction procedures involving observationally-derived data enabled the tester to check a wide-range of behaviors regularly and thus provide the staff with a base-line and with on-going measures of progress/regression as these related to treatment. The problem of testability would then be largely eliminated, since the cooperation of the patient was not needed. This approach was the direction which staff behavior rating scales would take (e.g., Miller & Parachek, 1974; Plutchik, Conte, Lieberman, Bakur, Grossman, & Lehrman, 1970). Instruments using purely observationally derived data generally have been used to address issues pertaining to functional behavior including ADLs, and not "mental

status" per se. Therefore, their development will not be reviewed here.

Several investigators chose to incorporate both direct interview-derived items and behavioral observation items into one mental status screening instrument. In the development of a mental status scale for geriatric patients, Fishback (1977), for example, used several questions directed at careproviders and two observation items to gain information about patient behavior to rate activities of daily living. These items were added to interview items from instruments developed by Kahn et al. (1960) and by Pfeiffer (1975). Also included in this scale was a visual counting test ("How many fingers am I holding up?...") which was designed to provide discriminative power among the most impaired patients.

Fishback claimed that the addition of ADL items enhanced the instrument's applicability. Certainly the use of ADL items would allow greater insight into a patient's functional level. However, since the Fishback test included only three such items, its usefulness as an indicator of behavioral competence was extremely limited. Furthermore, since the relationship of functional behavior and cognitive status had not been addressed, the addition of ADL items was of doubtful diagnostic value.

A number of criticisms of the investigation may also be made. For one thing, no data regarding reliability of the test were presented. In addition, validity was estimated only via a demonstration of correlation between the results of the questionnaire and clinical judgment involving unspecified procedures. Though this correlation was said to be "close" (Fishback, 1977, p. 168), no specifics were given. No attempt was made to demonstrate the test's usefulness in distinguishing between functional and organic processes, a critical issue in the assessment of geriatric individuals. Despite its 35 item length, the test had no constructional items, no test of immediate memory, and no test of learning. If nothing else, these omissions affected the face validity of the instrument. Potential psychometric problems relating to item validation and weighting issues can also be noted. For example, the test assigned equal weight to items with totally different criteria for validation. Thus ADL items (which may have criterion validity in and of themselves) were weighted equally with items which have little criterion validity and which may or may not have construct validity. Perhaps for these reasons, the Fishback Test never gained widespread acceptance. It is too bad that this investigator did not more closely pursue the relationship of cognitive status and functional behavior.

It might have been here that a more unique contribution could have been made.

In the next section a number of closely analogous tests of geriatric mental status (i.e., "cognitive status") will be reviewed. As many of the items in the various scales are shared in common and the remaining items also closely relate to similar dimensions in mental functioning, it has been suggested that these scales may be regarded as more or less interchangeable (Gurland, 1980). This assumption will be evaluated as the review proceeds through literature describing efforts to substantiate the reliability and validity of these scales individually and in comparison to one another. Of the various analogous tests, the focus primarily will be on the seminal work of Kahn et al., (1960) in the creation of the Mental Status Questionnaire (MSQ), the instrument undoubtedly most influential on subsequent efforts, and on the Mini-Mental State Examination (Folstein et al., 1975), the instrument being used in the current investigation.

One writer (Gurland, 1980) has called the MSQ "the most widely used test of the cognitive impairments in an organic brain syndrome" (p.678). Although the current review of the literature would lead to a different conclusion regarding frequency of usage, it seems indisputable that the MSQ has been the most influential of the brief contemporary geriatric mental status screening

instruments. The MSQ was among the first to provide standardization of administration format, quantification of response scores, and demonstrable validity.

The MSQ originally consisted of 31 questions which covered the following major areas: orientation, memory, calculation, and general and personal information. These questions were drawn partly from informal mental status procedures developed by clinicians over the years and partly from studies which investigated the relationship between altered behavior and cerebral dysfunction. From the total of 31 questions, 10 items were chosen by discriminant function analysis as most useful in identifying elderly patients with organic brain syndrome (Kahn et al., 1960). Procedures for asking these questions were standardized. By obtaining a score based on the number of errors in response to these 10 questions, a quantitative index of mental functioning was provided.

As part of the original investigation, the MSQ was administered to a random sample of 1,077 elderly individuals residing in homes for the aged, nursing homes, and state hospitals in New York City. Each subject was examined by a psychiatrist using clinical interview techniques and by a psychologist who administered the MSQ and the Face-Hand Test (Fink et al., 1952). The results of these standardized tests were found to be correlated with the psychiatrists' clinical evaluations of the

presence or absence of psychosis associated with chronic brain syndrome, opinion as to certifiability, and degree of management problem (the parameters of which were unspecified). However, these relationships were addressed using quite elementary statistical procedures. In addition, relationships were specified only for those patients scoring at the very extreme of the MSQ (i.e., scores of 0 or 10). Subsequent investigations went much further in documenting the reliability and validity of this instrument. These are reviewed below.

The test-retest reliability of the MSQ was evaluated by Wilson, Roy, and Bursil (cited in Gurland, 1980; cited in Nelson et al., 1986), who administered the instrument four times a week at three week intervals to 55 elderly patients selected because their condition was likely to be stable. The authors reported that approximately 75% of the scores either changed by only one point or did not change. Reliability of the MSQ was evaluated by Leshner and Whelihan (1986), who reported a test-retest correlation of .87, Spearman-Brown corrected split-half correlation of .82 and Cronbach alpha of .81. Inter-rater reliability data have not been published for the MSQ (Nelson et al., 1986).

Subsequent to the initial paper (Kahn et al., 1960), a number of studies have been conducted providing additional data in support of the validity of the MSQ.

Most of these investigations have involved the use of nonstandardized clinical diagnostic procedures as the criterion measure. For example, Fillenbaum (1980), for community-dwelling elderly individuals, found a significant correlation of MSQ results and (nonstandardized) clinical diagnoses of organic mental disorder made by psychiatrists. With a 2-error cutoff, 96% of unimpaired patients were classified correctly; 55% of impaired subjects were classified correctly. Cresswell and Lanyon (1981) reported that the MSQ correlated significantly ($r = -.87$) with an organicity criterion based on independent ratings of two psychiatrists and one psychologist. Unfortunately, in evaluating the reliability of the criterion ratings, the authors found that the ratings of one of the judges did not correspond well with those of the other two judges and therefore discarded the ratings of that judge (thus providing a good example of why validity testing procedures which use clinical interviews as criterion may be suspect). Using a similar criterion measure (staff ratings of confusion) for 31 extended care geriatric inpatients and for 40 community dwelling elderly subjects, Brink et al. (1978) reported that only three subjects were mis-identified using the results of the MSQ.

One attempt to document the concurrent validity of the MSQ was found in the literature. Zarit et al.,

(1978), for 153 patients at a gerontology clinic, found a relationship between MSQ scores and scores on the Babcock Story Recall, Paired Associates, and Digits Backward: increased MSQ errors corresponded with poorer performance on these tests. The form of the reported data did not permit the calculation of a correlation coefficient, however. Studies comparing the MSQ with other brief mental status instruments have been conducted (Haglund & Schuckit, 1976; Lautenschlaeger, Meier, & Donnelly, 1986). These will be reviewed in a subsequent section.

Perhaps because the MSQ was among the first to address a number of psychometric issues, it was widely influential in the development of subsequent instruments. A number of modifications of the MSQ were completed to adapt the instrument for settings other than the long term care setting for which it was intended. For example, Pfeiffer (1975) altered several items of the MSQ to create an instrument appropriate for use in office or outpatient settings. This instrument is entitled the Short Portable Mental Status Questionnaire, or SPMSQ. The SPMSQ was administered to 997 community dwelling people, all aged 65 or older. Of these 926 (93%) completed the test. A scoring system for the SPMSQ was derived by looking at the distribution of error scores on the scale for the community dwelling population as a whole and for educational and racial categories separately. The result

was an instrument designed to be used with outpatient geriatric populations which provided scoring adjustments for educational and racial variables. The validity of the SPMSQ was tested along two dimensions: One dimension involved the construct validity of the SPMSQ (i.e., does it actually test for organicity?). The other dimension involved the scoring system of the SPMSQ (i.e., does a particular score, modified for educational level and race, serve as a quantitatively accurate indicator of organic impairment?). To answer these questions, the SPMSQ was administered to two non-random populations: one a group of elderly outpatient (clinic) referrals; the other, a group of institutionalized geriatric patients. The distribution of error scores of these two non-random populations, when compared to the initial community dwelling random population, were different enough to give face validity to the SPMSQ as a measure of organic impairment. Pfeiffer undertook the task of demonstrating construct validity in the usual way: he compared results of the SPMSQ with independent clinical diagnoses both for the outpatient group and for the institutionalized elderly. For the clinic group, there was a 92 percent agreement between the SPMSQ score and the clinical diagnosis when the SPMSQ indicated definite impairment, and 82 percent agreement when the SPMSQ indicated either no impairment or mild impairment ($\text{Chi}^2 = 63.35$ with 1 df.,

$p = .001$). A second validity study involved a comparison of the total error score on the SPMSQ with the clinical diagnosis for some 80 subjects. Within the category of moderate to severe impairment on the SPMSQ, 88 percent of those "failing" the SPMSQ had been diagnosed as having organic brain syndrome by the evaluating clinicians. On the other hand, the agreement between clinicians and the SPMSQ for intact or mildly impaired subjects was a lower, but still significant 72 percent ($\text{Chi}^2 = 11.48$ at 1 df., $p = .001$).

Several other investigations of the validity of the SPMSQ have been conducted. For 83 community-dwelling elderly individuals, Fillenbaum (1980) found a correlation between SPMSQ and psychiatrists' non-standardized clinical diagnoses. SPMSQ sensitivity was reported to 55%; specificity was 96%. Wolber, Romaniuk, Eastman, and Robinson (1984) also examined the construct validity of the SPMSQ using diagnoses by two psychiatrists. For 95 consecutive admissions to an inpatient geriatric unit of a state psychiatric hospital, they found significant differences in correct SPMSQ response rates between the group with organic diagnoses and the group without organic diagnoses. Using standardized diagnostic procedures to place subjects into non-/mildly demented and moderately/severely demented criterion groups, Erkinjuntti, Sulkava, Wikstrom, and Autio (1987) reported

the ability of the SPMSQ to accurately separate community residents (N = 119) and medical inpatients (N = 282). Sensitivity and specificity of the SPMSQ were reported to depend on the number of test errors chosen for the cut-off point. Using the cut-off point of three errors, the sensitivity of the test was 86.2% and the specificity was 99.0% among medical inpatients. The percentages in the community sample were 66.7% and 100% respectively.

The concurrent validity of the SPMSQ was evaluated by Wolber et al. (1984), who used a number of psychological tests as criteria. Correlations with these tests were reported as follows: Bender Gestalt, .60; Digits Forward, .49; Digits Backward, .63; Digit Span, .66.

Pfeiffer (1975) provided evidence for the reliability of the SPMSQ. Test-retest correlations (separated by a four-week interval) were .82 and .83 for the two groups tested, thus indicating relatively good stability of the results over time and freedom from significant practice effect or deterioration of performance over time.

A number of other modifications of the Kahn-Goldfarb MSQ (Kahn et al., 1960) were completed to adapt the instrument for specific settings. The Cognitive Capacity Screening Examination was created to provide mental status screening on an acute medical unit (Jacobs et al., 1977). The Orientation Test (Irving et al., 1970) and the Mental State Questionnaire (Wilson & Brass, 1973) were developed

for use in British geriatrics inpatients units. Similarly, a 'mental state questionnaire' was adapted for use with elderly acute medical admissions (Black, 1987). The Confusion Assessment Schedule (Slater & Lipman, 1977) was adapted largely from the MSQ to be used in a British study examining the relationship between architectural design of buildings and the spatial disorientation of confused residents.

Various versions of brief mental status instruments have been translated and adapted for use in other countries as well. For example, the Cognitive Capacity Screening Examination (noted above) was translated into Hebrew and adapted for use with hospitalized elderly patients in Israel (Omer, Foldes, Toby, & Menczel, 1983). The MMSE (Folstein et al., 1975) has been translated into Japanese for use in a study of hypergraphia (Yamadori, Mori, Tabuchi, Kudo, & Mitani, 1986) and into Spanish for use in an epidemiological survey of a community of mixed ethnicity (Los Angeles) (Escobar et al., 1986).

Another brief geriatric mental status instrument, the Mattis Organic Mental Syndrome Screening Examination (MOMSSE) (Mattis, 1976) did not spring solely from the MSQ. This instrument was created using a sampling of items from several WAIS subtests (Digits, Information, and Similarities), a Benton geometric figure and items from the Eisenson Test of Aphasia, in addition to orientation

items similar to those found in the MSQ and its analogs. Although the MOMSSE was found to be useful in discriminating the dementia patient from normals (Mattis, 1976), it, like others of its ilk, was often too demanding to discriminate among dementia patients. Because of this limitation, the Dementia Rating Scale (DRS) was developed (Coblentz et al., 1973). The Dementia Rating Scale contained a number of items sampling behavior consonant with preschool age development, thus providing a much lower floor and allowing discrimination among dementia patients. This instrument required approximately 30 to 45 minutes to administer and involved evaluation of attention, perseveration (both verbal and motor), drawing ability, verbal and nonverbal abstraction, and verbal and nonverbal short-term memory. Each subsection was hierarchically organized so that the examiner may assume mastery of all items following within that section. (No effort to validate this assumption was reported.)

Two studies attempted to demonstrate the reliability of the DRS. The test-retest reliability with one week interval ranged from .61 to .96 among the subtests (Coblentz et al., 1973). No overall test-retest correlation coefficient was reported. A split-half reliability coefficient of .90 was obtained with a group of 25 geriatric nursing home residents (Gardner, Oliver-Munoz, Fisher, & Empting, 1981). No reports of

inter-rater reliability were found by this reviewer, and this is consonant with reports by other reviewers (Nelson et al., 1986).

Because of its reported usefulness in discriminating among dementia patients, the Dementia Rating Scale has been used repeatedly in investigations designed to determine the relationship of cognitive and physiological functioning. For example, test scores of the DRS have been shown to correlate in the mid .80's with cerebral blood flow through grey matter and with frontal blood flow (Coblentz et al., 1973; Gardner et al., 1981; Mattis, 1976). For patients with clinically diagnosed (unspecified procedures) dementia of the Alzheimer type (N = 17), DRS results have been shown to correlate significant with cortical metabolism assessed by positron emission tomography: for DRS results and left temporal lobe metabolism, $r = .67$; for metabolism in other regions, $r \geq .50$ (Chase et al., 1984).

Construct and concurrent validity studies using the DRS have been reported. In a study involving 111 neuropsychological clinic patients being evaluated for dementia vs. depression, Montgomery and Costa (cited in Nelson et al., 1986), found DRS scores < 123 in 62% of patients with dementia (n = 26), in 36% of those with brain damage (n = 45), in 12% of those with psychologic disorders (n = 34), and in none of 6 patients with

depression. The criteria for clinical diagnoses were not specified. In a separate study, these same authors (also cited in Nelson et al., 1986) reported a significant correlation between DRS results and a composite of other neuropsychological tests applied to community-dwelling elderly ($r = .67$). The measures included the Vocabulary subtest of the WAIS, the Boston Naming Test (Kaplan, Goodglass, & Weintraub, 1983), and the Benton Visual Retention Test (Benton, 1974). Relating more to predictive validity, Mattis (1976) reported that a DRS score under 100 is often not consonant with survival over the next 20 months if the patient does not have "careful supervision and extraordinarily effective nursing care" (p. 99).

The Mini-Mental State Examination (MMSE)

Based on the findings of the current review of the literature, the Mini-Mental State Examination (MMSE) (Folstein et al., 1975) is the most widely cited and frequently used measure of cognitive mental status, and there is evidence that its use is increasing (Anthony, LeResche, Niaz, Von Korff, & Folstein, 1982). It has been frequently cited as being particularly applicable to the assessment of dementia (Canter, 1978; Cummings & Benson, 1986; Goldschmidt, Mallin, & Still, 1983; Jagust, Budinger, & Reed, 1987; Klein et al., 1985; Kraiuhin,

Gordon, Meares, & Howson, 1986; Larson, Reifler, Canfield, & Cohen, 1984; Larson, Reifler, Sumi, Canfield, & Chinn, 1986; Luxenberg, Haxby, Creasey, Sundaram, & Rapoport, 1987; McKhann et al., 1984; Pfeffer et al., 1982; Reynolds et al., 1986; Roca et al., 1982; Steele, Lucas, & Tune, 1986; Summers, Majovski, Marsh, Tachiki, & Kling, 1986; Thal, Grundman, & Golden, 1985; Veterans Administration, 1985; Vitaliano, Breen, Albert et al., 1984; Vitaliano, Breen, Russo et al., 1984; and Winograd & Jarvik, 1986). Other investigators have used the MMSE singularly or as part of a larger battery to measure overall cognitive functioning (Brown, Marsh, & LaRue, 1982; Fields, MacKenzie, Charlson, & Sax, 1986; Taylor, Abrams, Faber, & Almy, 1980) and to screen for inclusion into research samples (Abrams, Alexopoulos, & Young, 1987; Kraiuhin, Gordon, Stanfield, Meares, & Howson, 1986). In addition, the National Institute of Mental Health has included a version of the MMSE in its Diagnostic Interview Schedule. As such, it is being used in the Epidemiologic Catchment Area Program surveys of mental disorders in general populations and in other NIMH-sponsored research (Eaton, Regier, Locke, & Taube, 1981, cited in Anthony et al., 1982).

The MMSE includes 11 questions divided into two sections, the first of which requires vocal responses only and covers orientation, memory and attention. The maximum

score is 21. The second section tests ability to name, follow verbal and written instructions and, in contrast to other tests such as the MSQ (Kahn et al., 1960) and the SPMSQ (Pfeiffer, 1975), also measures constructional capacities (Anthony et al., 1982). The maximum score is 9. The total possible score for both sections is 30 points. The test is not timed and requires only five to 10 minutes to administer.

The reliability of the MMSE has been assessed in a number of investigations. In the original paper describing the instrument, Folstein et al. (1975) presented evidence of satisfactory test-retest and inter-tester reliability for elderly depressed and demented hospitalized patients. For tests administered by the same examiner within 24 hours, $r = .887$, $p < .0001$ (Wilcoxin T for differences between first and second administrations: n.s.). For tests administered by different examiners within 24 hours, $r = .827$ (Wilcoxin T: n.s.). Over a period of 28 days for elderly patients considered clinically stable, $r = .988$ ($p < .0001$).

Similarly high reliability coefficients have been reported by other investigators. For consecutive neurological/neurosurgical admissions ($N = 126$; mean age = 49.9) and 17 additional patients with known cognitive impairment, Dick et al. (1984) reported the following indicators of test-retest reliability:

1. Within 24 hours
 - same examiner: $r = .92$
 - different examiner: $r = .95$

2. Mean Interval of 31 days (range = 7-70): no significant group differences

Similar findings were reported by Anthony et al., (1982): 24 hour test-retest coefficients of .85 for 58 subjects determined not to be delirious or demented and .90 for subjects judged to be demented.

In a study designed to test the reliability of sixteen mental status cognitive tasks, five of which were taken directly from the MMSE and four of which were adapted from the MMSE, Taylor et al. (1980) reported correlation coefficients ranging from .59 to 1.0 for MMSE-related items. Based on the above findings, the MMSE appears to be quite reliable and free from practice effects. One writer, however, warned of the possibility of "studying" for the MMSE, based on behavior seen among residents of a retirement home who gave each other answers and practiced together prior to standard examinations using the MMSE (Keating, 1987).

Validity for the MMSE has been established in a number of ways. For example, numerous studies have established the diagnostic validity of the MMSE using nonstandardized clinical diagnoses or unspecified diagnostic procedures as the criterion (Anthony et al.,

1982; Dick et al., 1984; Folstein et al., 1975; Goldschmidt et al., 1983; Klein et al., 1985; Lautenschlaeger et al., 1986). Populations sampled in these investigations included medical inpatients (Anthony et al., 1982; Klein et al., 1985), psychiatric inpatients and normal elderly (Folstein et al., 1975). Conclusions about MMSE sensitivity (ability to identify actual positives) and specificity (ability to exclude actual negatives) have been stated in several of these reports. With a cut-off score of ≤ 23 for cognitive disturbance, one group found that the MMSE had a sensitivity of 87% and a specificity of 82% judged against a psychiatrist's diagnosis of dementia or delirium (Anthony et al., 1982). Using the same cut-off score, Klein et al. (1985) examined the sensitivity and specificity of individual items of the MMSE. They reported that the sensitivity of individual orientation items was low (meaning that excessive percentages of demented patients responded correctly to these items), but that the specificity of orientation items was quite high (meaning that few non-demented subjects answered these incorrectly). On the other hand, non-orientation items such as serial 7's or spelling "world" backwards were sensitive in the detection of dementia, though specificity was low (meaning that relatively large percentages of cognitively intact subjects responded incorrectly to these items). A

multivariate discriminant equation using both orientation and non-orientation items achieved high sensitivity (89.6%, 87.5% validation cases) and specificity (78.1% test cases, 87.5% validation cases). Adding subject age to the equation further increased sensitivity (95.8%, 91.3%), while maintaining specificity (82.3%, 85.4%). Again using the 23 point cut-off score (and indicating that it produced the most accurate classifications), Dick et al. (1984) reported sensitivity of 76% and specificity of 95.1%. These results suggest that the MMSE may be used successfully to screen for dementia among patients. However, one caveat in particular must be mentioned. The relationship between performance on cognitive status items in general and previous level of education has been pointed out (Hinton & Withers, 1971; Rosen and Fox, 1986), and this relationship may hold for performance on MMSE items (Anthony et al., 1982; Cavanaugh & Wettstein, 1983; Dick et al., 1984), a situation potentially resulting in increased frequency of false positives among those with less education. Though this relationship does not appear to hold consistently with the MMSE (Teng, Chui, Schneider & Metzger, 1987), it would be wise, particularly with patients with less than nine years of formal education, (Anthony et al., 1982), to avoid conclusions about cognitive status based solely on MMSE results.

The inadequacy of validation of mental status instruments using nonstandardized diagnostic procedures has already been discussed. Fortunately, conclusions about the overall validity of the MMSE need not be based solely on the results of this type of validation study; a number of recent concurrent validity studies have also been conducted. For neurological inpatients (N = 20) with and without cognitive impairment, Dick et al. (1984) reported a significant relationship between MMSE scores and WAIS IQ scores (for Verbal IQ, $r = .55$, $p = .01$; for Performance IQ, $r = .56$, $p = .02$; for Full Scale IQ, $r = .52$, $p = .02$). Similar results were reported when the subjects were all cognitively impaired (N = 30). Mostly in quite recent investigations, the MMSE has also been validated against other measures of cognitive function, including brief mental status examinations (Haddad & Coffman, 1987; Lautenschlaeger et al., 1986; Pfeffer et al., 1982; Thal et al., 1985). The results of the various comparison studies will be discussed later.

In other concurrent validation studies, for patients referred to a university hospital radiology department, MMSE results were found to be related to computerized tomography (CT) scans of the brain (Tsai & Tsuang, 1979). Patients with negative CT scans scored significantly higher than patients with positive scans. Generalized cerebral atrophy was found to be more closely related to

MMSE results than focal cerebral lesions only. Martin et al. (1987) reported a relationship between MMSE scores and biopsy-gathered cortical plaque counts in patients with clinical diagnoses of probable Alzheimer's disease. MMSE scores were seen to relate to level of serum folate among 200 patients older than 60 years with suspected dementia of the Alzheimer's type (Larson et al., 1986).

A number of additional validation studies have been conducted on the MMSE. For 141 Alzheimer patients, performance on the MMSE showed significant negative correlation with duration of illness ($r = -.50$, $p < .001$) (Teng et al., 1987). Reynolds et al. (1986) determined that for 16 patients with mixed symptoms of depression and dementia, improvement at a two year follow-up was associated with MMSE scores greater than 21. For 116 patients admitted to medical units at a large urban hospital, those determined cognitively impaired using MMSE results (score < 24) were found to be sicker, less stable, and more clinically complex (Fields et al., 1986). In-hospital mortality (17% vs. 5%) and morbidity (39% vs. 18%) rates were higher for the cognitively impaired patients; however, these differences could be explained by the greater severity of illness, instability, and comorbidity found in these patients. Cognitively impaired patients had longer lengths of hospital stay, spent more

time in hospital awaiting placement, and were more likely to be discharged to a nursing home.

Summary: Usefulness and
Limitations of the MMSE

The MMSE appears to be a reliable and valid measure of cognitive mental status for general adult and for elderly populations. Its concurrent and predictive validity have been investigated, though much work remains to be completed in these areas. The MMSE is not sensitive to localization/lateralization of lesions. It is especially difficult to pick up right hemisphere involvement using only the MMSE, despite the fact that this instrument does provide a constructional task. Dick et al., (1984), for example, found no differences between right hemisphere patients and normals on MMSE scores. It is possible that adding more constructional/visuo-spatial items to the MMSE would enhance the instrument's ability to discriminate among cognitively impaired.

In addition to education factors mentioned above, ethnicity, race and language factors may influence MMSE scores (Cavanaugh & Wettstein, 1983) and it may thus be necessary to adapt the MMSE specifically for use with various ethnic or racial subgroups. For example, Anthony et al. (1982) found MMSE specificity to be lower for Black (.78) than for White (.94) patients. However, they state that this difference may have been an artifact of

educational status. A number of researchers have reported that appropriately adapted versions of the MMSE may be used in other countries without apparent difficulties. For example, Yamadori et al. (1986) successfully used an adapted MMSE to evaluate the cognitive status of Japanese patients displaying right hemisphere symptoms. Dick et al. (1984) used an adapted version of the MMSE in their study of the validity of this instrument for British neurological patients. In contrast, others have reported difficulty using the MMSE unchanged for certain groups of American subjects. Escobar et al. (1986) found the MMSE problematic if used unchanged with Hispanic-American groups. In particular, the following items were seen to be influenced by ethnicity, language, and/or educational level:

1. Orientation items: Spanish language; ≤ 8 years education; aged ≥ 60 - all tended to make more errors.

2. Attention/Calculation items: Increased errors in spelling and serial 7's related to ethnicity, language, and educational level. Increased errors in spelling related to age.

3. Memory items: Related to age; *not* related to educational level or ethnicity.

4. Copy Design: Related to age and educational level. *Not* related to ethnicity or language.

5. Language items: Related only to educational level.

Escobar et al. (1986) concluded that in its current form, MMSE scores lack sufficient accuracy for assessing "true" cognitive impairment among Spanish speaking Hispanic-American populations.

In addition to these weaknesses, the MMSE may be criticized because in some ways its psychometric properties remain largely unrefined. For example, the value of each item of the MMSE is equal though no data have been reported which support the validity of this normatively or diagnostically.

A revised version of the MMSE has recently been presented and reported on (E. L. Teng, personal communication, September 1, 1987; Teng & Chui, 1987; Teng et al., 1987). The authors provide more rigorously standardized scoring procedures which allow, among other things, variable credit for varying degrees of accuracy on orientation, recall, similarities and writing items. (Stating that the current year is 1932 would, for example, have greater diagnostic implications than stating that it is 1986, and differential scoring of these answers would enhance the sensitivity of the instrument.) In addition, the authors have specified the inclusion of a number of new items designed to sample a broader range of cognitive functions, cover a wider range of difficulty levels, and

enhance the reliability and validity of the scores. These changes in particular increase the instrument's usefulness in differentiating among non-demented persons or among patients in more advanced stages of dementia. The addition of items drawn from common human experiences (e.g., date and place of birth, body parts, laughing/crying, eating/sleeping) may enhance the instrument's applicability to persons from different cultural and ethnic backgrounds. It would appear that these changes would begin to address a number of those weaknesses noted in the original MMSE. The validity of this assumption, of course, remains to be tested. It is unfortunate that the revised version of the MMSE was not yet available at the time data was being collected for the current investigation.

Comparison Studies Using Mental Status Instruments

In this section, studies comparing two or more brief cognitive mental status instruments will be reviewed.

Two studies were found which provided direct comparison of the reliability of two or more brief cognitive mental status instruments. Leshner and Whelihan (1986) examined the reliability of eight mental status instruments for skilled and intermediate care nursing home residents (N = 36). The following tests were compared: Blessed Information-Memory-Concentration Test (Blessed

Dementia Scale or BDS) (Blessed, Tomlinson, & Roth, 1968); Extended Mental Status Questionnaire (EMSQ) (Whelihan et al., 1984); Information-Orientation Section (IOS) (Pattie & Gilleard, 1975); Mental Status Questionnaire (MSQ) (Kahn et al., 1960); Orientation Scale (OS) (Kastenbaum & Sherwood, 1972); Short Orientation-Memory-Concentration Test (SOMCT) (Katzman et al., 1983); Short Portable Mental Status Questionnaire (SPMSQ) (Pfeiffer, 1975); Simplified Mental Status Questionnaire (Isaacs & Walkey, 1963). Lesher and Whelihan (1986) evaluated test-retest, split-half, and internal consistency of these eight scales. The test-retest values for all the instruments except the OS (.76) were above .80, suggesting acceptable stability over two to four weeks' time. However, these values may not be "pure" test-retest measures: because different examiners were used, correlations were composed of variance related both to examiner differences and to sources of random error. With the exception of the OS (.68) and the SOMCT (.37), the instruments demonstrated equivalent halves. Lack of internal consistency is not necessarily unacceptable for mental status instruments, since these typically are intended to assess gross functioning in several areas (Kane & Kane, 1981). For what it is worth, however, Lesher and Whelihan (1986) found marginal internal consistency in only two instruments, the OS and

the IOS; the other six tests demonstrated Cronbach alpha values above .80. The authors concluded that in general most of the instruments are of equal value with regard to reliability. In another study using a sample of 39 patients diagnosed with senile dementia of the Alzheimer type (Thal et al., 1985), comparable test-retest reliability values were found for the MMSE (.81) and the Blessed Dementia Scale (.89).

The current review of the literature yielded four investigations of simple concurrent validity between two or more brief cognitive mental status instruments. For psychiatric-geriatric patients, Haddad (1982, cited in Haddad & Coffman, 1987) reported a high correlation ($r = .81$) between MMSE scores and Cognitive Capacity Screening Examination (CCSE) scores. For patients with senile dementia of the Alzheimer type, Thal et al. (1985) reported a similarly high correlation ($r = .83$) between scores obtained on the MMSE and scores obtained on the Blessed Dementia Scale. Haglund and Schuckit (1976) compared the MSQ and the SPMSQ for assessing organicity in a sample of 279 male geriatric admissions to medical and surgical wards at a VA hospital. These investigators reported a high degree of correlation between the MSQ and the SPMSQ ($r = .84$). It was found, likewise, that both tests correlated well with the diagnosis of organic brain syndrome based on unspecified clinical findings (MSQ: $r =$

.556, $r^2 = .309$, $p < .00001$; SPMSQ: $r = .63$, $r^2 = .397$, $p < .00001$). Leshner and Whelihan (1986) reported inter-instrument correlations among the eight brief mental status instruments listed in the previous section. These correlations ranged from .77 to .96, with the mean inter-instrument correlations ranging from .80 to .90.

Two studies comparing the diagnostic sensitivity and specificity of two or more brief mental status instruments were found. Fillenbaum (1980) compared the MSQ and the SPMSQ for a stratified random sample of 120 community residents drawn to represent all combinations of impaired and unimpaired functional status. For the criterion measure, Fillenbaum used non-standardized psychiatric examination procedures in conjunction with a semi-structured diagnostic conclusion procedure to generate diagnoses of organic brain syndrome (OBS) (no reliability data reported). Fillenbaum reported comparable sensitivity and specificity for the two tests. The level of specificity was particularly high (only 4% of the unimpaired were falsely identified as impaired). However, sensitivity was not comparably strong, since approximately 50% of subjects diagnosed as impaired were missed by both instruments. In identifying OBS, the SPMSQ was found to explain slightly more of the variance than the MSQ (SPMSQ: $r = .7072$; MSQ: $r = .6793$; both both, $p < .001$). In another comparison study of sensitivity and

specificity involving 21 elderly patients admitted to an acute treatment hospital, Lautenschlaeger et al. (1986) reported values for the MMSE and the MSQ (MMSE: sensitivity = 76%, specificity = 64%; MSQ: sensitivity = 83%, specificity = 100%). They concluded that their data did not suggest that one scale was superior to the other, but that they may be used to complement one another, suggesting that for MMSE scores below 24, the MSQ be administered. Unfortunately, this particular study had a number of serious weaknesses. The relatively small sample size limits the reliability and generalizability of the findings. Perhaps more seriously, although some mention was made of retrospective examination of clinical diagnoses on discharge, the criterion measure was not clearly reported.

One study was found which attempted to assess the predictive validity of several brief measures of mental status (Berg, Edwards, Danzinger, & Berg, 1987). These authors examined the ability of three tests (SPMSQ, Blessed Dementia Scale, and the Face-Hand Test) to predict the severity of dementia on follow-up examination. Subjects included a group of healthy elderly (N = 58) and a group of patients diagnosed with mild senile dementia of the Alzheimer type (N = 43). Both groups were matched for age and education. The authors reported that measures derived from all three instruments were stable for healthy

subjects over a 30 month course. While all the scales were sensitive to changes in performance of the demented sample, none of the instruments could reliably predict which of the mildly demented subjects would become more severely demented over a 30 month course.

Based on the (admittedly limited) literature available, one could conclude that for the most part cognitive mental status instruments have been found quite comparable; no one instrument demonstrates significant advantages in terms of reliability of diagnostic, concurrent, or predictive validity. In general, these instruments provide better resistance to false positives than to false negatives and are thus problematic when they are being used to screen patients who do not overtly demonstrate signs of cognitive loss. These conclusions are consistent with those of previous reviewers (cf. Nelson et al., 1986). Although no instrument displays clear-cut advantages among the instruments surveyed, it would appear that the MMSE has been most widely examined and is the most frequently reported brief cognitive mental status instrument being used for clinical and research purposes. As has been noted, a revised version of the MMSE recently has been developed (Teng & Chui, 1987; Teng et al., 1987) to address a number of previously reported weaknesses, including the tendency among all such instruments to result in unacceptable levels of false

negatives. A number of other brief mental status instruments have recently been developed, with protocols quite similar to those already reviewed here (Berg & Svensson, 1980; Copeland et al., 1976; Haddad & Coffman, 1987; Whelihan et al., 1984). The authors of these instruments also report an interest in addressing various unsolved problems in mental status assessment. However, descriptions of the development of these new instruments typically present quite limited reviews of the literature and little mention is made of previously developed scales. Rationales supporting the need for another instrument and discussion of how the new scale addresses existing psychometric or clinical problems are often not provided. As one encounters many of these new scales, one is left with a strong sense that the wheel is repeatedly being reinvented.

Mental Status Assessment and Functional Behavior

It can be said that the relationship of mental status assessment results and functional behavior has important theoretical implications for the validity of the construct of cognitive functioning, since it potentially grounds the construct in observable behavior. Addressing the relationship from the opposite direction, Pfeffer et al. (1982) ground the theoretical relationship in more applied terms: is functional behavior as represented by everyday

social and occupational skills so overlearned that it cannot be used as a measure of cognitive functioning in the manner of neuropsychological tests; or do functional behaviors represent separate, but related, attributes of innate and learned cognitive capacity? The relationship of cognitive tests and functional behavior also is of applied/practical interest because there is a need for instruments used in the diagnosis of dementia to have validity regarding functional behavior. Many instruments bear little relation to actual behavioral deficits seen in dementia (Crook, 1983). This relationship is critical if the clinician is to validly use cognitive mental status instruments to generate answers to questions of disposition on discharge (i.e., whether to send a patient home or to an institution).

Research to date on the relationship of cognitive mental status and functional behavior has been sporadic and inconclusive.

A number of papers simply reporting correlations between measures of cognitive mental status and measures of functional behavior can be found. Several investigations have reported moderate correlations between measures of cognitive function and an instrument designed to assess activities of daily living in elderly individuals. For example, Plutchik, Conte, and Lieberman (1971) investigated the relationship of a mental status

instrument (Geriatric Interpersonal Evaluation Scale or GIES) based partly on the MSQ and the Geriatric Rating Scale (Plutchik et al., 1970), an instrument concerned with determining how well a patient is able to function both physically and socially on the ward. These investigators reported that the GIES could be used to discriminate between the upper and lower quarters of the GRS distribution. When scores for all 78 patients in the sample were compared, the correlation between GIES and GRS scores was $-.49$. Wolber and Lira (1981) reported a relationship ($r = -.632$) between Bender-Gestalt error scores and functional behavior as measured by the Basic Living Skills Assessment (BLSA). The BLSA, designed to assess the behavioral functioning of geriatric patients, consists of interviewer ratings of 31 personal hygiene behaviors and ADLs that presumably reflect the patient's ability to function independently in the environment. In another study, Wolber et al. (1984) reported a moderate ($r = .57$) relationship of SPMSQ results and Basic Living Assessment (BLSA) results with elderly psychiatric patients.

The reader of these reports may conclude that there is indeed a relationship between cognitive mental status and functional behavior. However, the moderate degree of correlations reported limits the clinical usefulness of these findings. Perhaps a study conducted by Wilson et

al. (1973) will provide a useful illustration. Using an adapted version of the MSQ, these investigators related the mental status of 100 female geriatric inpatients to ADL test results provided by occupational therapists. Only patients whose physical handicaps did not interfere with the examinations were included in the study. These authors found that while high scores on the adapted MSQ were associated with good functional competence, low scores were not necessarily associated with poor functional competence. Thus, it is conceivable that functionally independent patients with low scores on a mental status assessment instrument could be inappropriately placed in an institutional setting based on the assumption that cognitive status clearly predicts functional status.

To further complicate the picture for the clinician, other reports have been published which do not unequivocally demonstrate a relationship between cognitive mental status and functional behavior. For example, in a study involving a quite small number ($N = 7$) of subjects in the early stages of Alzheimer's disease, Weintraub et al. (1982) concluded that the extent of involvement of cognitive functions as tested in a neuropsychological evaluation may not reflect the level of a patient's functional capacity at home.

Perhaps one of the more complex attempts to determine the relationship of cognitive status and functional behavior came about as a result of an attempt to validate a new scale for the measurement of functional capacity (Functional Activities Questionnaire; Pfeffer et al., 1982). In this study, a number of tests of cognitive functioning were used as validity criteria. The rationale for this procedure was not clearly stated, though it was implied that the functional scale may serve as a method of differentiating among demented individuals. Subjects ($n = 195$, aged 61-91) were among those living in a retirement community of 22,000 who were referred by physicians as "normal" or "mildly demented". Subjects' performance on two measures of functional behavior, the Independent Activities of Daily Living Scale (IADL; Lawton & Brody, 1969) and the Functional Activities Questionnaire (FAQ) were found to correlate significantly with several measures of cognitive status: MMSE (IADL = $-.55$; FAQ = $-.71$); Raven, subtest B (IADL = $-.42$; FAQ = $-.41$); Symbol Digit Modalities Test (IADL = $-.52$; FAQ = $-.68$); MSQ (IADL = $-.62$; FAQ = $-.76$). Despite a number of methodological weaknesses noted in the study (particularly pertaining to procedures for assigning level of functional capacity and pertaining to the approach used to validate the "mental function index"), these findings suggest a clear-cut

relationship between the results of measures of functional capacity and tests of cognitive skills.

In a more recent study using the Functional Activities Questionnaire, Hershey et al. (1985) found significantly different scores on the FAQ among demented (Alzheimer's, n = 11; Parkinson's, n = 12; multi-infarct, n = 13) and non-demented, age-matched patients with Parkinson's (n = 22) and without Parkinson's (n = 22). Unfortunately, the cognitive measures/criteria involved in assignment to groups were not reported.

Two other relatively recent studies suggesting a relationship between cognitive and functional status have been conducted (Vitaliano, Breen, Albert et al., 1984; Vitaliano, Russo, Breen, Vitiello, & Prinz, 1986).

In a study designed to determine the degree to which cognitive test scores predicted functional competence in 34 senile dementia of the Alzheimer type (SDAT) patients varying in severity of dysfunction, Vitaliano, Breen, Albert et al. (1984) concluded that with certain constraints, it is possible to predict functional competence in SDAT patients from a knowledge of the attention and memory deficits they display. The authors used the Record of Independent Living (RIL; Weintraub et al., 1982), a 20 item third party report measure to assess functional competence in activities of daily living (e.g., toileting, feeding) and higher level activities

(recreation, reading, writing) and items taken from the MMSE (Folstein et al., 1975) and the DRS (Coblentz et al., 1973; Mattis, 1976). They noted an association between a number of cognitive abilities and competence in recreational activities. An interesting finding was that a simple item from the MMSE (three-stage command) was the best single indicator of a SDAT patient's ability to engage in recreational behavior. In contrast, maintenance behavior, which requires a lower level of functional competence, was associated only with the attention and design recognition tasks from the DRS. A number of weaknesses in this study limit the usefulness of the findings: 1. The patient populations is described as SDAT though the diagnostic criteria employed do not allow this to be specified. 2. Diagnosis per se appears to be based largely on informal clinical interviews and reports by the participants' primary collaterals. This is a relatively weak procedure. 3. Perhaps of greater concern is that assessment was not conducted under blind conditions; one examiner provided all assessment.

In a later study, Vitaliano et al. (1986) used the Record of Independent Living (RIL) to classify severity of dementia among subjects previously diagnosed with Alzheimer's disease. As was noted above, the RIL provides measures of maintenance and higher functioning. Using the RIL to classify subjects resulted in homogeneity of scores

within groups. Because of this, the authors reportedly were unable to obtain significant correlations between the measure of cognitive function (DRS) and functional behavior. However, the authors used multiple regression procedures to examine the degree to which the initial maintenance, higher functioning and the DRS were jointly predictive of maintenance and higher functioning scores at 18-26 month follow-up. Their findings suggest that functional behavior at follow-up can be predicted using initial functional behavior scores and that this prediction can be greatly enhanced using cognitive measures. In the prediction of maintenance at follow-up, for example, 74% of the variance could be explained using the initial maintenance score and the DRS results. In the prediction of higher functioning, in contrast, the initial higher functioning score itself accounted for 67% of the variance; only one subsection of the DRS (Attention) added significantly to the variance explained at follow-up (11% change in variance for a total of 78% explained). This study, then, also supports the contention that there is a significant relationship between cognitive test results and functional behavior. It would have been a stronger study had it investigated the relationship of changes in cognitive performance to changes in functional behavior over time. In addition, the generalizability of these findings is reduced by the small sample size (N = 15 for

Alzheimer patients; N = 22 for controls). Furthermore, the credibility of the findings is weakened somewhat because, as in the previous study, only one examiner provided all cognitive and functional assessments.

Summary of Literature Review

The general direction of assessment of "mental status" over the last five decades has proceeded from a certain level of disorganization and lack of psychometric sophistication to increased attention to reliability and validity issues and greater focus on tailoring a given instrument to the specific needs of geriatric populations.

Procedures designed to assess the "mental status" of patients have been in the clinical armamentarium for years. In the 1930's, a number of informal clinical tests of orientation and memory were in general use. However, normative standards were not available, and these tests were typically applied in a rather haphazard manner without any consistent process of standardization or validation (cf. Hinton & Withers, 1971). (Despite the fact that numerous investigators have documented that informal, non-standardized clinical assessment of mental status procedures are fraught with reliability and validity problems, these approaches continue to be used today.)

By the early 1950's, clinicians were becoming aware of the need to improve the instruments being used. It appears that initial attempts involved combining a number of brief, already available tests into one standardized instrument to assess the overall "mental status" of a patient. "Mental status", as conceptualized by these workers, probably would be translated most accurately as "psychiatric status", a description of the patient's condition in a wide range of areas (well beyond merely cognitive) based on behaviors observed or inferred. In general, these instruments were improvements psychometrically in that they were more systematically organized than previous assessment procedures. In addition, the issue of reliability was beginning to be addressed - often, however, with mixed results. Attempts to assess the validity of instruments were typically unidimensional and unsophisticated, with unstandardized, informal clinical assessment of psychiatric status being the usual criterion measure. Typical psychometric weaknesses of these instruments during this time included incomplete or unavailable reliability estimates, excessively subjective estimates of severity of symptoms, lack of operationalization of constructs, weak or missing validity measures, lack of normative data, unspecified diagnostic utility and, for geriatric assessment,

excessive length and lack of specificity for that population.

During the next decade, increased psychometric sophistication on the part of clinicians was evident. The focus of mental status instruments developed during this period was considerably narrowed and intensified both in terms of the behavior being measured and the population being addressed. "Mental status" questionnaires focused more specifically on cognitive issues only. Areas of orientation, mental control, memory and, in some cases, construction were emphasized; affective and psychiatric issues typically were eliminated. Unnecessary items were eliminated in an effort to make the instruments shorter and easier to administer. Greater emphasis was placed on establishing reliability and validity. Most of the mental status instruments developed since 1960 showed acceptable reliability. Validity, to a large extent, continued to be based on unstandardized clinical impressions as the outcome measure. However, more recently a number of studies have attempted to establish the concurrent validity of mental status instruments. For example, moderate correlations have been noted between performance on mental status scales and WAIS IQ scores (Dick et al., 1984). A number of studies have shown moderate to strong correlations among mental status questionnaires. Other investigators have shown relationships between mental

status instrument results and a number of non-invasive medical measures of impairment, including EEG (Irving et al., 1970) and CT scan (Kaszniak, Garron, & Fox, cited in Zarit, 1980).

One area in which evaluation of mental status instruments has not yet been sufficiently investigated is the relationship of such instruments to behaviors related to self-care and to social and occupational functioning. This lack of established ecological validity for mental status instruments constitutes a problem because, despite ongoing assumptions, most instruments relate only theoretically to actual behavior deficits and have not been validated against performance outside the clinic or laboratory in relevant tasks of daily life (Crook, 1983).

CHAPTER III

METHOD

Subjects

The subject sample consisted of 40 individuals aged 65 or older (mean: 81.55; standard deviation: 7.9; range: 66-96) being admitted to the Geriatric Evaluation and Treatment Unit (GETU) or the Neurology Unit of the Salt Lake City Veterans Administration Medical Center (SLC VAMC). Because of the relatively small proportion of female patients admitted to either of these units at the SLC VAMC (approximately 5%) inclusion of such patients in this study would clearly result in an unbalanced sample. Therefore, it was decided that only a male population would be investigated in this project and only males were included in the sample.

Note that dementia per se is not a criterion for admission to either the GETU or Neurology Unit. Therefore a broad range of cognitive abilities, as well as medical problems is typically seen in this population. To eliminate possible contaminating factors in the investigation of the relationship of cognitive functioning and independent living skills, subjects selected for inclusion in the study met the following criteria:

1. They demonstrated overall physical functioning sufficient to complete the requirements of the

research protocol. This meant that at a minimum they had to be ambulatory within a short range (e.g., bed to bathroom, ward to dining room); they had to be able to recognize most people by sight alone, and had to be able to understand what is said, if with some difficulty.

2. Subjects were free of any acute medical condition affecting their ability to follow the research protocol. This includes, of course, medical conditions which would affect overall cognitive functioning. Therefore, patients demonstrating evidence of delirium and/or patients taking prescribed medications which possibly affected their mental status were eliminated from consideration. (Note that once acute medical situations were clearly resolved, these patients were then eligible for reconsideration for inclusion. However, no patients were eligible for inclusion if an event [e.g., recent in-hospital CVA] occurred to alter the patients pre-hospital functional capacity.)

In addition, each subject was fluent in English. Each subject had a significant other (e.g., spouse, relative or close friend) who interacted with the subject on a regular basis (three times per week minimum) and who

could therefore provide information regarding the subject's functioning at home. This procedure is consistent with recommendations made by the NINCDS-ADRDA Work Group Under the Auspices of the Department of Health and Human Services Task Force on Alzheimer's disease (McKhann et al., 1984).

Patient assessment for exclusion/inclusion in the study occurred during regularly scheduled twice weekly multi-disciplinary rounds consistently involving the following medical personnel: the attending physician, medical and family practice residents and interns, nursing staff, the staff psychologist and interns in psychology, the staff social worker and interns in social work, the speech and language pathologist/audiologist, the staff physical therapist, occupational therapists and the clinical pharmacy post-doctoral fellow and pharmacy interns. Each patient was evaluated post-admission by psychology personnel, using information provided during rounds to complete the GETU Staff Clinical Impression Form (see Appendix A). Evaluation typically took place during the first multi-disciplinary rounds to occur after the patient's admission. On some occasions, completion of the form was delayed several days to allow staff members to become more familiar with the patient.

To determine the reliability of the GETU Staff Clinical Impression Form, it was completed by both the staff psychologist and the author under blind conditions for the first 10 patients admitted to the GETU once the study begun. This procedure resulted in 100% concordance regarding appropriateness for inclusion of the patients into the study. The form was therefore deemed reliable enough to use as an initial inclusion/ exclusion screening instrument.

Selection of the sample from patients meeting the inclusion criteria was based on order of admission. Patients accepted using this screening instrument who upon actual assessment proved to be inappropriate (n = 3) were then dropped from participation (of this group, one patient proved to be too hard of hearing for satisfactory participation, one was not fluent enough in English to participate, and one proved to be more medically involved than anticipated and did not participate until his condition had improved).

Though aphasia is frequently seen in demented patients (Haber, Shuttleworth, Paulson, Bellchambers, & Clapp, 1986), it was decided that cases in which *extreme* aphasia was noted would not be appropriately evaluated using the research protocol. Parsons and Prigatano (1978) state that disturbed language functioning may

significantly affect the understanding of oral or written instructions or the communications of answers to questions--or both. Inferences made about disturbed, non-verbal higher cortical functioning in such patients may be incorrectly made. It is of especial importance to identify aphasic subjects and the nature of the aphasic disturbances in studies of general effects of brain damage in which estimates are made of overall levels of intellectual functioning. Because of these considerations, a screening instrument was used to eliminate severe cases of aphasia (see Appendix A for Aphasia Checklist). However, of all candidates screened for inclusion in this study, only two were eliminated because of extreme aphasia. One of these was eliminated also because of confounding problems associated with extreme hearing deficits and because of lack of cooperation.

Because of the many medical problems demonstrated by the population being studied, only approximately 26% of admitted patients met inclusion criteria and of those, a fairly substantial percentage were not available for the study because they were not on the unit long enough for involvement.

Participation in this study was entirely voluntary and all potential subjects were informed about the

specifics of involvement in the study (see Appendix B). Potential subjects who had not previously been adjudged incompetent and who could clearly indicate understanding of the requirements of the study were then included if they gave signed consent. This procedure appears consistent with guidelines specified in the literature regarding research involvement of patients who are potentially compromised cognitively: patients are generally considered competent until proved otherwise (Dubler, 1987; Raber, 1984); competence to understand the procedures involved, costs/risks and benefits, a critical variable (Cassel, 1987), is a discrete instance of competence, potentially different from issues involving competence in other, broader areas (Dubler, 1987; Raber, 1984). Thus, many elderly persons with declining or compromised abilities retain the capacity to provide consent for certain protocols (Dubler, 1987). When the costs/risks of a study are low (as they were in this study), patient judgment regarding participation is not as critical. Among those potential subjects who had legal guardians, participation in the study required consent from both the guardian and from the patient. Only one such patient met other inclusion criteria and was included in the study.

Of 158 patients initially evaluated for inclusion, only five (3%) refused to participate. Table 1 lists various reasons and percentages for nonparticipation (including refusal) in the study.

Table 1

Reasons and Percentages* for Nonparticipation

Acute Medical Condition:	10%
Aphasia:	2%
Deceased:	6%
Discharged Prior to Evaluation:	12%
Female:	6%
Hearing:	6%
Non-Ambulatory/Hemiparesis:	20%
Non-Primarily English Speaking	3%
Non-Responsive:	1%
Refused:	4%
Second Admission:	14%
Third Party Respondent Not Available:	7%
Vision:	7%

*Of total patients *not* participating in the current study. Note that some patients demonstrated more than one condition.

To summarize, subjects were alert male VA patients free of severe aphasias, reversible dementias, with no disorders or medication causing mental impairment, no acute medical situation-induced delirium and, as will be discussed later, with depression and other psychiatric disorders accounted for. Criteria similar to these have been used by researchers in previous studies involving assessment of demented and non-demented elderly subjects (cf. Berg et al., 1982; Storandt, Botwinick, Danzinger, Berg & Hughes, 1984). The challenge of recruiting elderly subjects for research using strict inclusion criteria is illustrated by the Berg et al. (1982) study. These researchers, using strict inclusion criteria including visual impairments, psychiatric disorders, diabetes mellitus, cerebrovascular disease, acute and/or chronic medical/neurological disorders, but including hypertension, were able to generate only 43 subjects with mild senile dementia of the Alzheimer type in a metropolitan area of approximately 2.5 million persons. By comparison, the current study (with admittedly less strict inclusion criteria and not requiring a diagnosis of dementia per se) was more successful in generating appropriate subjects.

Measures

The study was designed to determine the relationship between measures of cognitive status and functional behavior. Measures of cognitive status included the Mini-Mental State Examination (MMSE) (Folstein et al., 1975), the Wechsler Memory Scale (WMS) (Wechsler, 1945) and the Vocabulary subtest of the Wechsler Adult Intelligence Scale-Revised (WAIS-R). Affective status was assessed using the Beck Depression Inventory (BDI) (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961; Beck, Rush, Shaw, & Emery, 1979). Functional competence was measured using the Scales of Independent Behavior (SIB) (Bruininks, Woodcock, Weatherman, & Hill, 1984) and the Parachek Geriatric Behavior Rating Scale (PGBRS) (Miller & Parachek, 1974). What follows is a general description and rationale for the use of these instruments.

Although the Mini-Mental State Examination (MMSE) was described in detail in the Review of the Literature, it is also included in this section. The MMSE (Folstein et al., 1975) is a widely cited and frequently used measure of mental status particularly applicable to the assessment of dementia (cf. Canter, 1978; Cummings & Benson, 1986; Goldschmidt et al., 1983; Larson et al., 1984; Klein et al., 1985; Kraiuhin et al., 1986; McKhann et al., 1984; Pfeffer et al., 1982; Reynolds et al., 1986; Roca et al., 1982; Steele et al., 1986; Summers et al., 1986; Thal et

al., 1985; Veterans Administration, 1985; Vitaliano, Breen, Albert, et al., 1984; and Winograd & Jarvik, 1986). Other investigators have used the MMSE as part of a larger battery designed to measure overall cognitive functioning (Brown et al., 1982; Taylor et al., 1980). This instrument includes 11 questions divided into two sections, the first of which requires vocal responses only and covers orientation, memory and attention. The maximum score is 21. The second section tests ability to name, follow verbal and written instructions and copy a complex geometric figure. The maximum score is 9. The total possible score for both sections is 30 points. The test is not timed and requires only five to 10 minutes to administer. The MMS meets the criteria of being satisfactorily reliable, of having been validated against other measures of mental status, and of being appropriate to and normed on an elderly sample. In addition, it is easily administered and scored and also provides a wider range of possible scores than most brief measures (Glen, 1982). For the purposes of the present investigation, instructions involving reading and writing were enlarged to approximately one inch lettering. This procedure is congruent with suggestions made by the authors (Folstein et al., 1975) regarding eliminating possible effects of impaired vision.

The Wechsler Memory Scale (WMS) was first standardized approximately 40 years ago and has become perhaps the most widely used instrument with which clinicians and researchers assess memory function (Bak & Greene, 1981; Brinkman, Lergen, Gerganoff, & Pomara, 1983; Erickson, Poon, & Walsh-Sweeney, 1980; Haaland, Linn, Hunt, & Goodwin, 1983; Margolis & Scialfa, 1984; Pirozzolo & Lawson-Kerr, 1980; Russell, 1975, 1981; Solomon, Greene, Farr & Kelly, 1986). Its use has been supported by hundreds of published studies (Prigatano, 1978). The WMS has been shown to possess acceptable psychometric reliability (test-retest with normal sample = .75; test-retest with psychiatric-neurological sample = .89) (Ryan, Morris, Yaffa, & Peterson, 1981). The WMS has proved to be a useful addition to psychometric protocols designed to diagnose dementia (Bruno, Mohr, Gillespie, Fedio, & Chase, 1986; Eslinger, Damasio, Benton, & Van Allen, 1985). At least several studies have involved the use of the WMS in conjunction with the WAIS or its subtests (particularly the Vocabulary subtest) as a way of differentiating normal aged from senile aged and in the development of cutoff scores indicative of short term memory deficits (Goggin, 1975, cited in Browning & Spillich, 1981) and to document memory impairment in patients with Korsakoff's psychosis (Mair et al., 1986). Subsequent research has supported Goggon's use of the WAIS

and the WMS as a way of matching young and aged individuals on an intellectually related task while differentiating normal aged from senile aged (Spilich, 1978, 1979). The WMS has additionally been used as an outcome measure to study the effects of anterior and unspecified temporal lobectomy on cognitive function (Ivnik, Sharbrough, & Laws, Jr., 1987; McMillan, Powell, Janota, & Polkey, 1987, respectively). The WMS has been used as part of a battery to document the effects of drugs on memory (Molloy, 1987). Other investigations have related WMS results to EEG slowing and cerebral atrophy (Kaszniak, Garron, Fox, Bergen, & Huckman, 1979). Finally, a relationship has been found between WMS scores and subsequent duration of survival (Siegler, McCarty, & Logue, 1982).

The WMS consists of seven subtests: personal and current information, orientation, mental control, logical memory, digits, visual reproduction, and associate learning. Age-referenced values are added to raw scores to give a "Memory Quotient" (MQ), which is based on a normal curve with a mean of 100. However, at the time of this study, age referenced values were not available for subjects beyond the age of 75 and it has been argued (Prigatano, 1978) that the MQ is therefore of limited usefulness for persons beyond this age. Rather than attempt to extrapolate these values for older subjects, it

was decided to use raw scores only. Because relationships between cognitive status and functional behavior were being investigated in this study, placing scores within a normative context was not considered directly relevant.

A relatively recent adaptation of the WMS (Russell, 1975) reportedly permits it to be used as a measure of recent as well as immediate memory, without altering its ease of administration or its clinical utility. The Russell adaptation of the WMS involves repeating two of the original subscales after a one-half hour interval. This procedure is consistent with recent findings which argue against treating memory as a unitary function, and allows the investigator to gain more information with little additional testing time (Russell, 1975). The Russell adaptation originally utilized a mixed group of 75 brain-damaged and 30 normal subjects (Russell, 1975). More recently, it has been normed on superior elderly individuals (Haaland et al., 1983). Others have demonstrated its ability to discriminate between normal aged and demented aged (Logue & Wyrick, 1979) and between elderly normals and patients specifically diagnosed with Alzheimer's disease (Brinkman et al., 1983).

During the current investigation, the Russell adaptation was attempted for the first 10 subjects. However, little variance resulted (seven of 10 patients scoring zero on both subtests; two of the remaining three

scoring zero on one of the two subtests). Within this sample, no relationship was seen between either Logical Memory or Visual Reproduction Russell subtest scores and WMS initial raw scores (for Logical Memory, $r = -.09$; for Visual Reproduction, $r = .02$). The lack of variation noted with the 30 minute delayed recall of the two paragraphs in the Logical memory subtest of the WMS appears to be consistent with results reported by Cauthen (1977). This investigator noted that delayed recall of Logical Memory paragraphs showed a clear decline for subjects over an 80 year cut-off age. The mean age of the first 10 subjects in the current study was 78.9. Because it added time to each battery administered without appearing to provide useful data, the additional delayed recall procedure was dropped from the assessment battery.

The Vocabulary subtest of the Wechsler Adult Intelligence Scale-Revised (WAIS-R) (Wechsler, 1981) was used as an additional measure of current mental status. In addition, the subtest served as a rough measure of each subject's highest previous level of intellectual functioning since it is reportedly the least vulnerable to the effects of aging per se (Botwinick, 1977). The Vocabulary subtest is a 40 item scale which measures the subject's ability to define words presented both visually and orally. The subtest typically takes from 10 to 15 minutes to administer. Again, for reasons similar to

those influencing our use of raw scores for the WMS, we did not convert Vocabulary subtest raw scores into scaled scores.

To determine the possible influence of depression on the relationship of cognitive and functional status, all individuals involved in this study were screened for depressive symptomatology. This was considered important in a study involving a population of elderly medical inpatients because not only is depression present in as many as one third of medical inpatients (Rodin & Voshart, 1986) but depression has been identified as the most common mental disorder among all groups over the age of 65 (Finlayson & Martin, 1982). In a significant portion of elderly individuals with depression, (estimated between 10 to 15%), depression is associated with considerable deficits in memory, attention, and other cognitive functions (Walton, 1958; Wang, 1981). In addition, the possibility of the influence of *age* on the relationship between cognitive status and depression has been reported (Cavanaugh, & Wettstein, 1983; McHugh & Folstein, 1979).

The Beck Depression Inventory (BDI) (Beck et al., 1961) was used to screen individuals for depression. The Beck Depression Inventory is a widely used 21-item self-report measure of the intensity of depressive symptomatology (Gallagher, Nies, & Thompson, 1982; Reynolds & Gould, 1981). Not truly a diagnostic

instrument, the BDI is a dimensional scale and, as such, is sensitive to fluctuations in symptoms, avoids observer bias, and is relatively brief and easy to administer (Oliver & Simmons, 1984). The BDI has been shown to have acceptable reliability and validity in a general adult population (Beck, 1967; Foelker, Shewchuk & Niederehe, 1987; Metcalfe & Goldblum, 1965; Nussbaum, Wittig, & Hanion, 1963), and is widely used in clinical research (Foelker et al., 1987; Oliver & Simmons, 1984). Oliver and Burkham (1979) in a study involving repeated measures across a three week interval for university students reported a significant product-moment correlation coefficient ($r = .78$). Bumberry, Oliver, and McClure (1978) reported satisfactory concurrent validity in a study using psychiatric estimate as the criterion ($r = .77$). The BDI has frequently been the instrument used to determine the prevalence of depressive symptoms in hospitalized patients (cf. Cavanaugh, 1983; Cavanaugh, Clark, & Gibbons, 1983; Clark, Cavanaugh, & Gibbons, 1983; Moffit & Paykel, 1975).

A number of other studies have demonstrated the reliability and validity of the BDI for various populations under various circumstances. For example, the BDI has been found to be a sensitive screening instrument for detecting depression in community populations when depression is defined by DSM-III criteria (Oliver &

Simmons, 1984). The BDI has been validated against clinical judgment (Metcalf & Goldblum, 1965). For consecutive administrations over three to six weeks, a significant relationship was noted between the BDI and the Hamilton Rating Scale (Hamilton, 1960): product-moment correlation = .68, $p < 0.001$ (Bailey & Coppen, 1976). A stronger relationship was noted between the BDI and the Inventory to Diagnose Depression (IDD), a self-report depression inventory designed to diagnose major depressive episode according to DSM-III criteria: $r = .87$, $n = 234$, $p < 0.001$ (Zimmerman et al., 1986).

The BDI has been shown to have acceptable reliability with both elderly community groups and with elderly patient groups (Gallagher et al., 1982). These investigators report test-retest reliability coefficients of .86 for normal elderly and .79 for depressed elderly individuals. Split-half coefficients were .74 for the normal sample and .58 for the depressed sample. However, as the authors correctly indicate, split-half estimates are probably not the best reliability index when used with depression measures and/or when used with depressives. Foelker et al. (1987) demonstrated that the short form of the BDI displays a factor structure in the aged similar to that observed in the general adult population. For older adults, the full Beck Depression Inventory has shown satisfactory concurrent validity with the Schedule for

Affective Disorders and Schizophrenia (SADS) (Endicott & Spitzer, 1978; Breckenridge, Thompson, Dessouville, & Amaral, 1982).

Several writers have disparaged assessment of the elderly using the BDI and other similar scales. Their position is based on the fact that somatic complaints are often inextricably bound to deteriorating medical status and may not thus be indicative of depression *per se* (Leshner, 1986; Vingiano, Nathan-Virga, Foldi, & Moss, 1986). They suggest that scales such as the Geriatric Depression Scale (Brink et al., 1982; Yesavage et al., 1983), which do *not* pull information regarding somatic complaints may be superior screens for depression in the elderly. This point has merit if one is primarily concerned about avoiding false positives in the diagnostic process. Other writers, however, counter that depression in the elderly is qualitatively different than that evidenced by other populations. Scales which do *not* allow assessment of somatic complaints should therefore be avoided since they are vulnerable to false negatives. Of specific concern is the possibility of "masked depression", "a disorder with significant subjective and functional disability marked by a cluster of vegetative symptoms but without prominent dysphoria or guilt" (Weiss, Nagel, & Aronson, 1986, p. 215). Thus, if one is interested in identifying symptoms of depression and

placing these on a continuum of severity rather than in making a diagnosis, and if one wishes to avoid false negatives (e.g., missing those patients who demonstrate "masked depression"), then scales which *do* pull for somatic complaints are probably more appropriate.

To summarize, the Beck Depression Inventory has been shown to be reliable and valid for a number of different populations, including the elderly. A dimensional scale which is sensitive to fluctuations in symptomatology, it has been widely used in clinical research. It is particularly useful in research which investigates the relationship between severity of depressive symptoms and other variables. Because it assesses for somatic complaints, it is less susceptible to false negative conclusions. For these reasons, it was deemed appropriate for inclusion in this study. To facilitate visual clarity, the BDI was printed with enlarged boldface type. Subjects were asked to complete the the scale individually. The examiner later returned to determine if the subject needed clarification of any items. On some occasions, the questions were read to the subject, who then indicated his choice of answers.

The Scales of Independent Behavior (SIB) (Bruininks et al., 1984; Bruininks, Woodcock, Weatherman & Hill, 1985) is a third-party respondent structured interview instrument designed to assess behaviors needed to function

independently in home, social and community settings. Its content measures those major aspects of social development and adaptive behavior that define an individual's ability to meet social and community expectations for personal independence, maintenance of physical needs, and acceptable social norms and relationships (Bruininks et al., 1984). Though a number of other scales have been developed to assess functional competency, such as the Plutchik Scale (Plutchik et al., 1970), the Performance Test of Activities of Daily Living (Kuriansky & Gurland, 1976), Kleban's scale (Kleban, Lawton, Brody, & Moss, 1976) and the Stockton Scale (Gilleard & Pattie, 1977), these emphasize low level activities and thus do not satisfactorily discriminate among individuals who are functioning at higher levels. Indeed, the instrument that is often cited as being useful in assessing activities common to retired adults, the Instrumental Activities of Daily Living Scale (Lawton & Brody, 1969) does not provide a detailed enough sampling of more complex behaviors (Pfeffer et al., 1982). It was for these reasons that the SIB, which does provide measures of higher level functioning, was chosen.

The SIB was standardized on a national sample of 1764 subjects ranging from infancy to adulthood. The norming sample was selected to be as representative as possible of the United States population from age 3 months to 40 years

and older (Bruininks et al., 1985). The authors state that one of the objectives in developing the SIB was to minimize potential sources of demographically-related bias (e.g., sex, ethnic, regional variables) in test items (Bruininks et al, 1985, p. 35).

The authors report acceptable reliability for the SIB. Overall split-half reliability coefficients for subscales range from .69 to .86. Split-half reliability for the Short Form was reported to be .78 for the adolescent-adult levels and .76 for all age levels. Test-retest reliabilities for the Full Scale and Short Form Broad Independence scores ranged from .87 to .96. The cluster test-retest scores ranged from the high .80s to the low .90s. Scoring of the SIB was found to be quite consistent among raters. Three sets of correlations were reported: interviewer-independent rater 1; interviewer-independent rater 2; independent rater 2-independent rater 3. Correlations were high ($r = .99$) for all subscale, cluster, and Broad Independence scores.

Validity of the SIB was established in a number of ways. Construct validity was assessed in studies demonstrating strong relationships between age and SIB scores. (Developmental characteristics are assumed to be demonstrated in adaptive behavior skills.) In addition, SIB scores of numerous groups of subjects with diverse intellectual abilities were compared. For example, for

both the Full Scale score and the Short Form score, comparisons of moderately to severely retarded and nonhandicapped adults resulted in significant differences between groups ($p = 0.0001$). For a group comprised of both adolescents and adults, group comparisons between high ability and normal subjects resulted in significant group differences for both the Full Scale score ($p = 0.002$) and for the Short Form score ($p = 0.031$). Concurrent validity was reported using the results of the Woodcock-Johnson Broad Cognitive Ability Scores as the criterion measure. For the handicapped adolescent-adult group simple correlations were quite high for both the Full Scale scores ($r = .79$) and for the Short Form scores ($r = .81$). For nonhandicapped adults and adolescents more modest correlations were reported (Full Scale: $r = .38$; Short Form: $r = .31$). The reduction in relationship is probably best explained by differential ceilings present in the two instruments; the SIB has a comparatively low ceiling and does not therefore differentiate as well between intact adult individuals as would the Woodcock-Johnson Broad Cognitive Ability test.

The Short Form Scale (SF-Broad Independence) of the SIB was used in this study. This version contains 32 tasks selected from the 14 original subscales of the long form of the SIB. For normal subjects aged three months to adulthood, the Short Form correlated well with the Full

Scale (Broad Independence): $r = .87$. The Short Form is designed for use when a brief overall evaluation is appropriate, and is especially appropriate for research applications. One slight modification of item 28 was implemented to make that item more appropriate for retired elderly people: The wording was changed to account for the likelihood that this group of people will not be in a position to fill out job application forms. No other modifications were done.

Scores obtained from the SIB include age scores, percentile ranks, standard scores, relative performance index (RPI), expected range of independence, and instructional range. However, because specific norms for elderly populations have not been developed for the SIB, these scores were not used in this study. The lack of normative data was not considered a major problem because, as has been stated previously, this study was designed to determine the relationship between cognitive performance and functional behavior; therefore, it was not considered important to place test results within a normative context. The results of the SIB were considered a criterion measure. No evidence has been found to suggest that third party reports are any less valid for the elderly than for younger groups. The validity of third party reports has been supported for other adult patient populations (Brooks & Lincoln, 1984; Sunderland, Harris &

Baddeley, 1983). The reliability of such measures are also no less suspect. However, as will be reported later, a limited investigation of the reliability of the SIB for elderly individuals was conducted during the course of this study.

The Parachek Geriatric Behavior Rating Scale--Revised Version (PGBRS) (Miller & Parachek, 1974) was used as an adjunct measure of functional behavior. This instrument was designed to indicate independent functioning within an institutional setting using information provided by nursing staff and other daily care providers. It is relatively brief and easy to administer, does not require patient cooperation, and requires little interpretation of the patient's behavior. The PGBRS was standardized on a stratified random sample drawn from a population of institutionalized geriatric patients. Concurrent validity of the PGBRS was demonstrated using a well-established scale (Plutchik Geriatric Rating Scale; Plutchik et al., 1970) ($r = -.88, p < .01$). Criterion validity was also demonstrated using therapists' judgment based on the Geriatric Psychology Diagnostic Profile of Behavior, a form in use at the Arizona State Hospital Rehabilitation Center ($r = .77, p < .01$). The authors have derived cutting scores for the PGBRS which can be useful for correct placement of patients for treatment programs, as well as for correlational studies such as this one,

which compare the results of one scale with those from another. For the purposes of the current study, the wording of one item of the Social Behaviors Section of the Parachek Geriatric Behavior Rating Scale was changed to reflect the fact that patients at the VAMC are not expected to assist with work on the unit. The new wording reflects patient assistance/cooperation in his own evaluation and treatment. A limited investigation of the reliability of the PGBRS for elderly VA patients was conducted during the course of this study.

Procedures

Selection of subjects for this study were based on order of admission. After inclusion/exclusion criteria were met, patients were briefed as to the general nature and intent of the study. If the subject agreed to participate, consent forms were signed and basic demographic data were gathered. Once consent was given, nursing staff were interviewed using the Parachek Geriatric Behavior Rating Scale (PGBRS). Only staff members quite familiar with each subject were interviewed. In most cases, this involved the nurse responsible for coordinating nursing care for the subject. Interviews were always conducted after a period of several days post admission to assure staff familiarity with the subject. Usually during the same day that the PGBRS was

administered, the Scales of Independent Behavior (SIB) were administered to the spouse, care provider, family member, or close friend familiar with the subject. It was not possible to evaluate the cognitive or affective status of the informants. However, no informant was chosen who was reported to be a poor historian by social work, nursing staff or medical staff interacting with that person. Both the PGBRS and the SIB were administered by the author, who was blind to data obtained during mental status assessment. Over a period of approximately three to five days, the following mental status protocol was administered to each subject: Mini-Mental State Examination (MMSE), Wechsler Memory Scale (WMS), Vocabulary subtest of the Wechsler Adult Intelligence Scale - Revised (WAIS-R). In addition, the Beck Depression Inventory (BDI) was administered. Mental status assessment was conducted largely by the staff psychologist assigned to the Geriatrics Evaluation and Treatment Unit. Portions of the assessment were also conducted by predoctoral interns in psychology under the supervision of the staff psychologist. As much as possible, an "interpersonal climate" appropriate and conducive to clinical neuropsychological research (Parsons & Prigatano, 1978) was provided during assessment. This meant that subjects were encouraged frequently. If tired, they were given a short break. Instructions were given

clearly and testing did not proceed until the subject demonstrated understanding. Supportive reassurance was appropriately given.

Data Analysis

All statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS/PC+). Group descriptive statistics were produced for all variables. The relationship among all variables was examined using a correlation matrix. Missing data were dealt with using a listwise deletion procedure. Stepwise multiple regression procedures were used to determine whether the predictor variables (i.e., the MMSE, WMS, and Vocabulary subscale of the WAIS-R) could predict the criterion (functional behavior) better than any one alone. Functional behavior was operationalized in two ways: functional behavior at home as measured by the SIB; functional behavior in the hospital as measured by the PGBRS. The relationship between these two scales was examined using correlation analyses.

CHAPTER IV

RESULTS

It was the goal of this study to examine the ecological validity of a number of measures of mental status for geriatric individuals by assessing the relationship between the results of these measures and functional behavior. In addition to examining the relative predictive or discriminant power of each test in relation to other tests, the study is also designed to determine if a wide variety of clinical measures improves the ability to estimate functional behavior and if so, to determine the relative contribution of each measure.

To provide information regarding the parameters of the results of this study, means and standard deviations of all measures are listed first. Because the measures of functional behavior must demonstrate satisfactory reliability and validity if they are to be used as outcome measures, the results of the supplementary investigation of these qualities are presented next. Relationships among all the variables are then reviewed using a correlation matrix. Next are results pertinent to the fundamental question addressed by the study: the relationship of mental status and functional behavior. Simple correlations are presented first, followed by the results of the multiple regression analyses designed to determine if a wide variety of clinical measures of

mental status may improve our ability to predict functional behavior.

Means and standard deviations for each measure are listed in Table 2.

Table 2

Means and Standard Deviations for All Variables

<u>Demographic Variables</u>	<u>Mean</u>	<u>S.D.</u>
Age	81.16	7.90
Educational Level	11.35	2.61
<u>Measures</u>		
Beck Depression Inventory*	8.21	5.40
Mini-Mental State Examination (MMSE)*	23.55	4.60
Parachek Geriatric Behavior Rating Scale*	45.52	11.77
Scales of Independent Behavior (SIB)*	76.02	14.70
WAIS-R Vocabulary subtest*	36.62	13.42+
Wechsler Memory Scale*	37.97	10.82++

*Raw Scores

+For oldest normative group available (ages 70-74), raw score mean is between 41-45.

++Normative mean raw score for elderly varies as a function of age and intelligence. Mean raw scores for ages 60-94 range from 40.7 to 63.5 (Cauthen, 1977).

Inter-rater Reliability of the
Measures of Functional Behavior

As mentioned in the Methods section, limited investigations of the inter-rater reliability of two of the functional behavior measures were attempted. Because these measures rely on information provided by lay-persons and others not accustomed to presenting information in a standard and systematic manner, it was considered especially appropriate to test whether results from these scales were consistent across informants. Results of this investigation are presented in Table 3. Unfortunately, the cross-informant approach did not lend itself to a large sample: For both measures, the extent of the investigation was limited by the number of appropriate informants available.

Table 3

Inter-rater Reliability of Two Measures of Functional
Behavior

SIB	(N = 6)	r = .943*
PGBRS	(N = 10)	r = .904*

*p < .01

In the case of the SIB, only six subjects could be found with two significant others available for interview who met the minimum familiarity criterion of three interactions with the subject per week. For each subject, a primary careprovider (usually a spouse) and a secondary careprovider were interviewed. The Pearson product-moment correlation coefficient used to estimate inter-rater reliability between the primary and secondary careproviders was high ($r = .943$).

A similar procedure was undertaken to determine whether the Parachek Geriatric Behavior Rating Scale (PGBRS) would yield consistent results across informants. As was mentioned previously, only nursing staff involved directly in the subject's care provided information to complete the PGBRS. Staff involvement in this portion of the study was affected primarily by time constraints and individual willingness to participate. The PGBRS was always administered individually to staff members for only one subject per administration. A total of 10 subjects were evaluated by separate nursing staff members. Parachek results were assigned to groups based on the order of administration. Mean age for subjects reported on was 81.0. As in the case of the SIB, the inter-rater reliability for the PGBRS was also high ($r = .904$).

Relationships Among the Variables

The relationships among all variables was examined using a correlation matrix (Table 4).

Table 4

Intercorrelation Matrix of All Measures

(N = 40)

	BECK	MMSE	PARA	SIB	VOC	WMS
BECK		-.213	-.279	-.350	.128	-.080
MMSE			.360	.495**	.207	.432*
PAR				.608**	-.102	.473*
SIB					-.011	.592**
VOC						.417*

*p <.01

**p <.001

BECK = Beck Depression Inventory
 MMSE = Mini-Mental State Examination
 PARA = Parachek Geriatric Behavior Rating Scale
 SIB = Scales of Independent Behavior
 VOC = WAIS-R Vocabulary subtest
 WMS = Wechsler Memory Scale

Cognitive Measures and
 Functional Behavior

Statistically significant relationships were found between cognitive measures and measures of functional behavior (see Table 4). A significant relationship was found between the Mini-Mental State Examination (MMSE)

and the Scales of Independent Behavior (SIB) ($r = .503$). The Wechsler Memory Scale (WMS) was related with both measures of functional capacity (with the SIB, $r = .592$; with the Parachek Geriatric Behavior Rating Scale, $r = .528$). A significant correlation was noted between the two measures of functional behavior, the SIB and the Parachek ($r = .608$).

Results of the Multiple Regression Analysis

Stepwise multiple regression procedures were utilized to determine which of the measures of cognitive functioning accounted for the greatest amount of variance associated with the two main measures of functional capacity (see Tables 5 and 6).

When the Parachek Geriatric Behavior Rating Scale was used as the dependent variable (Table 5), the greatest amount of variance was accounted for by the Mini-Mental State Examination (MMSE) ($R = .485$; $R^2 = .236$; $p = .0049$). Only the addition of the Wechsler Memory Scale accounted for a significant (when the probability of inclusion, or "PIN" = .05) increment in variance ($R = .583$; $R^2 = .34$; $p = .0024$).

When the Scales of Independent Behavior (SIB) was used as the dependent variable in the multiple regression analysis, changes in the proportion of variance accounted for by the various cognitive instruments were noted

Table 5

Regression Analysis: Parachek Geriatric Behavior
Rating Scale (PGBRS) as Dependent Variable

Step 1: Mini-Mental State Examination (MMSE) Entered

Multiple R	.48548
R Square	.23569
Adjusted R Square	.21021
Standard Error	10.03150

Analysis of Variance	DF	Sum of Squares	Mean Square
Regression	1	930.94394	930.94394
Residual	30	3018.93106	100.63104
F = 9.25106		Significance of F = .0049	

Step 2: Wechsler Memory Scale (WMS) Entered

Multiple R	.58316
R Square	.34007
Adjusted R Square	.29456
Standard Error	9.48072

Analysis of Variance	DF	Sum of Squares	Mean Square
Regression	2	1343.23931	671.61966
Residual	29	2606.63569	89.88399
F = 7.47207		Significance of F = .0024	

Variables in the Equation

Variable	B	SE B	Beta	T	Sig T
MMSE	-1.57792	.41463	-.62610	-3.806	.0007
WMS	.38539	.17994	.35236	2.142	.0407
(Constant)	67.42436	9.53402		7.072	.0000

(No other variables in the equation.)

Table 6

Regression Analysis: Scales of Independent
Behavior (SIB) as Dependent Variable

Step 1: Wechsler Memory Scale (WMS) Entered

Multiple R	.60817
R Square	.36987
Adjusted R Square	.34814
Standard Error	12.16426

Analysis of Variance	DF	Sum of Squares	Mean Square
Regression	1	2518.76617	2518.76617
Residual	29	4291.10480	147.96913
F = 17.02224		Significance of F = .0003	

Step 2: Beck Depression Inventory Entered

Multiple R	.68993
R Square	.47601
Adjusted R Square	.43858
Standard Error	11.28896

Analysis of Variance	DF	Sum of Squares	Mean Square
Regression	2	3241.53454	1620.76727
Residual	28	3568.33643	127.44059
F = 12.71783		Significance of F = .0001	

Step 3: WAIS-R Vocabulary Entered

Multiple R	.74413
R Square	.55373
Adjusted R Square	.50415
Standard Error	10.60927

Analysis of Variance	DF	Sum of Squares	Mean Square
Regression	3	3770.84433	1256.94811
Residual	27	3039.02663	112.55654
F = 11.16726		Significance of F = .0001	

Variables in the Equation

Variable	B	SE B	Beta	T	Sig T
WMS	1.02287	.19986	.69880	5.118	.0000
Beck	-.48896	.22110	-.28716	-2.212	.0356
Vocab	-.34014	.15685	-.29818	-2.169	.0391
(Constant)	55.88172	8.43756		6.623	.0000

(Table 6). In this case, the greatest proportion of variance was accounted for by the Wechsler Memory Scale ($R = .60817$; $R^2 = .37$; $p = .0003$). Two other instruments contributed significantly ($PIN = .05$) to the amount of variance explained. The Beck Depression Inventory was entered second ($R = .68993$; $R^2 = .476$; $p = .0001$) and the WAIS-R Vocabulary subtest last ($R = .74413$; $R^2 = .55$; $p = .0001$). Probably because of the degree of shared variance with the WMS, the Mini-Mental State Examination did not add significantly to the SIB variance accounted for.

Given the findings of Vitaliano et al. (1986), who reported that follow-up functional status was best predicted through a combination of initial cognitive and functional status, it was decided in the present investigation to examine the possible value of the Parachek Geriatric Behavior Rating Scale (PGBRS) in combination with cognitive measures in predicting Scales of Independent Behavior (SIB) scores. Should such a value be established, it would thus be feasible to use hospital-based observations to enhance the ability of cognitive instruments to predict functional behavior at home. When the PGBRS was included as an independent variable, it was entered first into the regression equation, accounting for approximately 37% of the

variance on the SIB ($R = .60754$, $R^2 = .36911$, $p = .0001$). The Wechsler Memory Scale was entered next, significantly increasing the amount of explained variance ($R = .69877$, $R^2 = .48828$, $p < .0001$). No other instrument contributed significantly to the proportion of the variance accounted for. The equation by this multiple regression analysis was as follows: $\text{PGBRS score (1.05601) + WMS raw score (.51558) + 10.99584 = estimated SIB score.}$

CHAPTER V
DISCUSSION

Validity of Measures
of Functional Behavior

It seems correct to conclude that the strength of the relationship seen between the Scales of Independent Behavior (SIB) and the Parachek Geriatric Behavior Rating Scale (PGBRS) provides evidence for the concurrent validity of these two measures. The correlation coefficient found between the SIB and the PGBRS whole score is indicative of a moderate relationship, with approximately 41% of the variance of one explained by the other. Though there is a large overlap between them, the relationship is limited to a certain extent because these two instruments were designed to assess different types of functional behavior. The PGBRS addresses questions pertaining to basic activities of daily living and cooperation on the hospital ward. The SIB is designed to assess more complex behaviors necessary for functional competence in a home setting. The SIB and the PGBRS therefore are not interchangeable. Each would be best used for the original purpose for which each was designed.

Reliability of Measures
of Functional Behavior

As noted in the Results section (Chapter IV), the inter-informant correlation coefficients were high for

both the Parachek Geriatric Behavior Rating Scale (PGBRS) (.943, $p < .01$) and the Scales of Independent Behavior (SIB) (.904, $p < .01$). Basing conclusions about reliability on evidence generated by such small samples is risky; however, the current reliability findings are not out of line with those reported by the authors of the SIB, although cross-informant (inter-rater) reliability per se does not appear to have been tested. It can be concluded for the SIB that the data do suggest that different informants may arrive at similar conclusions when care is taken to find informants who have a minimum of three weekly interactions with a patient. Regarding the results of the inter-rater reliability test of the PGBRS, the evidence indicated that the results of this instrument are consistent across informants, given that each informant is regularly involved in the individual's care.

Relationships Among Variables

As noted in the Results section, significant relationships were observed between the WMS raw scores and two other measures of cognitive functioning. The WMS and the MMSE demonstrated a moderate relationship ($r = .432$, $p < .01$). This finding is consistent with findings reported in the one previous study found in the literature which investigated the relationship of the WMS and the MMSE (Horton, Slone, & Shapiro, 1987). These authors reported

a Pearson product moment correlation of .64 for the MMSE and the WMS Memory Quotient for 12 male Veterans Administration patients. Though factor analysis is beyond the scope of the current investigation, it seems likely that the degree of shared variance seen is largely a function of equivalent items for assessing orientation and of items sharing some loading for mental control, attention/concentration and immediate memory. Although items on both instruments appear to load for recent memory and construction, it seems likely that their contribution is slight.

A moderate relationship was also observed between the results of the WMS and those of the WAIS-R Vocabulary subtest ($r = .417, p < .01$). It is quite possible that this relationship occurs as a function of a shared memory factor. Such a conclusion is supported by a number of factor analytic studies which suggest that a memory factor increases in prominence in older individuals to the point at which it has significant loadings in Vocabulary (e.g., Cohen, 1957a, 1957b, cited in Anastasi, 1972). While Vocabulary may maintain its integrity against age better than other measures, it is likely that individual differences in memory increase as a function of age and thus have a proportionally greater impact on performance in this area than had been true at earlier ages. Thus, while it is possible that age-related increases in

individual differences in memory may bring about a significant relationship between a measure of memory and a measure of vocabulary, the measure of vocabulary may not be seen to be related to age itself.

In contradiction to numerous observations in the literature (Walton, 1958; Wang, 1981; Wechsler, 1987), no relationship was found between measurable depressive symptomatology and cognitive performance as measured by any of the instruments used in this study. Explanation for this lack of relationship may reflect on the instrument chosen, with its heavy loading on somatic complaints. These may have a relatively equivalent effect on the cognitive functioning of most hospitalized patients, thus reducing variance to a point that a significant relationship could not be detected.

Measures of Mental Status and Functional Behavior

Of particular interest for the current study, significant relationships were found between measures of cognitive status and measures of functional behavior. While the Mini-Mental State Examination (MMSE) demonstrated a significant relationship with the Scales of Independent Behavior (SIB) ($p < .001$), the Wechsler Memory Scale (WMS) demonstrated a significant relationship with both the SIB and the Parachek Geriatric Behavior Rating Scale (PGBRS) (for both, $P < .001$). Erickson et al.,

(1980) point out that cognitive tests must have ecological validity. That is, they must be validated with respect to everyday behaviors: if, for example, a memory task is truly valid, then changes in test performance should reflect changes in the patient's ability to respond to real life demands. Based on this criterion, the current findings enhance the validity of the cognitive measures. Though of theoretical value, it must be remembered that the relationships of individual cognitive measures and functional behavior were moderate in strength and therefore are of less practical value for the clinician. In general it can be stated that approximately 25 to 35% of the variance of measures of functional behavior can be accounted for by one of these cognitive measures alone. That leaves a large amount of unexplained variance which can be attributed to various factors, including other areas of cognitive functioning, habit formation/overlearned skills, motivation, external stimuli, medical status, etc. However, it does seem clear that even among the extremely old, as represented by the current sample, measures of cognitive status can be used to enhance predictability of functional behavior.

Mental Status Batteries and Functional Behavior

Can various measures of cognitive status be used in combination to enhance the predictability of functional

behaviors? Based on the results of the current study, the answer is yes, though the gains are variable depending on which measure of functional behavior is being examined. Perhaps most importantly for the clinician concerned with discharge/disposition decisions, the predictability of Scales of Independent Behavior (SIB) results can be greatly enhanced through a combination of psychometric instruments. When the Wechsler Memory Scale (WMS) is used in combination with the Beck Depression Inventory and the WAIS-R Vocabulary subtest, fully 55% of the variance occurring on the SIB is accounted for. The equation generated by this procedure is as follows: $WMS \text{ score } (1.02287) + Beck \text{ score } (-.48896) + WAIS-R \text{ Vocabulary score } (-.34014) + 55.88172 = \text{estimated SIB score.}$

Alone, the Wechsler Memory Scale (WMS) accounted for only 27.9% of the variance for the Parachek Geriatric Behavior Rating Scale (PGBRS). When the Mini-Mental State Examination (MMSE) and the WMS are combined, over 37% of the variance is accounted for. This gain may have theoretical implications (that is, predictability of functional behavior may be enhanced through a combination of cognitive tests); however, the practical value in this particular case is quite limited, as the dependent variable itself (the PGBRS) may be obtained much more quickly and easily than the cognitive measures. The PGBRS itself may have usefulness in combination with cognitive

measures in predicting functional behavior. As reported in the Results section, the PGBRS, in combination with the WMS, accounted for approximately 37% of the variance on the Scales of Independent Behavior (SIB). Though this procedure does not account for as much of the total variance on the SIB as the combination of the WMS, Beck and WAIS-R Vocabulary subtest, it represents a significant savings in time demands on both the clinician and the patient, and additionally may be more appropriate for patients who have speech and/or language deficits due to aphasia or dysarthria.

From the clinician's point of view, the equations generated by these regression equations may be useful in estimating SIB scores. (It will be, of course, necessary to evaluate the use of these multiple regression equations in cross-validation investigations before their clinical use can be fully justified.) Estimating SIB scores would be particularly helpful in those cases in which no third party respondent is available to provide information on a patient's functional behavior at home. Though the current study suggests that this would occur in approximately 5% of the cases in a VA hospital setting (and it would seem likely that percentage would be less in private hospital settings), it must be remembered that this value represents only those patients who did not have a potential respondent. Exceptional amounts of time (and

effort) were spent by this researcher in pursuing respondents that were present but not easily available; exceptional amounts of time are not often available to the clinician. Under typical conditions, then, the percentage of occasions when informed respondents are not available to provide information about a patient's independent functioning probably would be considerably greater than 5%.

In using the multiple regression equation to predict Scale of Independent Behavior (SIB) scores, the clinician should be aware of issues related to regression toward the mean. The equation is likely to underestimate scores at the upper end of the SIB and overestimate scores at the lower end of the range. Thus, it could be concluded that this procedure appears to be somewhat excessively conservative with a tendency toward false positives rather than false negatives. This means that the clinician using the equation as an aid in determining readiness of independent living may assume non-existing incompetency for some patients. Knowing this, the clinician might then seek additional sources of data and additionally may recommend a closely monitored trial period of transition to an independent living situation.

Conclusions and Suggestions for Future Research

The current investigation demonstrates a relationship between mental status and functional behavior. The ecological validity of the Mini-Mental Status Examination and the Wechsler Memory Scale has been supported. In addition, the current study demonstrates that the ability to estimate functional behavior is improved by using a battery of cognitive tests. From a more theoretical perspective, evidence has been provided which supports the relationship between cognitive ability and behavior. It would appear that attention/concentration, mental control, orientation and memory are dimensions of cognitive functioning which relate to the ability to perform independent living activities. However, while present, the relationship between cognitive ability and functional behavior is far from perfect. Many variables not directly related to cognition enter into and affect behavior. The relative influence of such factors as habit formation, practice, and personality and cultural variables was not addressed in the current study.

What do these findings mean for the clinician? A number of general conclusions may be stated. Cognitive measures, used concurrently, predict functional behavior at home better than hospital based observations of

functional behavior. In addition to these general conclusions, the current study points to a number of specific steps the clinician can take to enhance efficacy of discharge planning for elderly individuals. In many cases, one can find informants who can provide information about the individual's level of functioning at home. This is preferable to making disposition decisions based only on information provided by cognitive evaluation. However, if as is often the case in the VA system, no satisfactory informant is available, then the clinician can generate assumptions about functional independence using a series of easily administered mental status tests. The battery of instruments utilized in the current study appear to be quite useful for this purpose. What if the cause for hospitalization brings with it additional potentially handicapping deficits which were not present when the informant last interacted with the patient at home? This does not change the best approach for the clinician: it remains important to use all sources of information available to inform the decision. An intriguing question for future research is whether hospital-based staff rating scales such as the PGBRS would become critical additions to batteries used in making discharge decisions for those patients who have had medically related changes which may make independent functioning more problematic.

A number of other suggestions for future research may be made. First of all, extensions of the current study are needed. For example, it would be quite useful to expand the population sampled to include women and patients in private hospitals. The V.A. hospital population is probably not entirely representative of the American population at large and it may be a mistake to generalize the findings of the current investigation to non-V.A. groups. There is a need to relate specific SIB scores with successful independent living for the elderly. Thus, another investigation is needed to generate SIB cut-off scores which predict successful functioning at home for this group. Having cut-off scores would clarify the meaning of estimated SIB scores generated by the multiple regression equations. SIB scores were not obtained post discharge in the current study. This is a weakness (though it is expected that medically stable patients without additional medically induced deficits should be able to return to their previous level of functioning). Future research should involve follow-up data collection using the SIB and perhaps home observation to more accurately determine the relationship of the various cognitive measures and functional capacity at home. In addition, a cross-validation study is needed to determine if the multiple regression equations continues

to predict SIB scores in a manner similar to that demonstrated with the current sample.

In addition to these extensions of the current study, there are a number of ancillary issues which could be explored. For example, it would be useful to examine the relationship of vocabulary scores to WMS scores with younger subjects as well as older ones to determine if an interaction is present between age, memory and vocabulary. This could determine if individual differences in memory do increase as a function of age and thus have a proportionally greater impact on vocabulary performance than had been true at earlier ages.

The issue of updating the current study must also be considered. The current study was conducted using what were the most recent versions of the Mini-Mental State Examination and the Wechsler Memory Scale. Recently, revised versions involving major changes have been published for each of these instruments. Therefore, it would be quite useful to replicate the current study using the revised versions of these two instruments.

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APPENDIXES

MENTAL STATUS ASSESSMENT
AND FUNCTIONAL COMPETENCE IN
GERIATRIC POPULATIONS

Appendix A. Data Gathering Forms

1. Geriatric Evaluation and Treatment Unit (GETU)
Staff Clinical Impression Form/Aphasia Checklist
2. Clinical Impressions - Physicians' Form

**MENTAL STATUS ASSESSMENT
AND FUNCTIONAL COMPETENCE IN
GERIATRIC POPULATIONS**

CLINICAL IMPRESSIONS - EXAMINER'S IMPRESSIONS

Patient Name: _____ SS#: _____

Examiner: _____ Date of Examination: _____

LEVEL OF CONSCIOUSNESS: (Check one)

1. _____ Alert
2. _____ Lethargic/somnolent
3. _____ Stuporous/semicomatose
4. _____ Comatose

Comment:

HEARING: (Check one)

1. _____ Clear, no problems discerned.
2. _____ Hears adequately with compensation (e.g., increased volume from E. and/or hearing aid).
3. _____ Clearcut difficulties regardless of compensation.

Comment:

VISION: (Check one)

1. _____ Sees well enough to read and recognize faces in the room without lenses (adequate level of light assumed).
2. _____ Sees well enough to read and recognize faces with lenses.
3. _____ Obvious difficulty with one or the other visual activity with lenses.
4. _____ Cannot do one or both activities despite use of lenses.

Comment:

MOTOR FUNCTIONING: (Indicate yes or no.)

1. Can patient ambulate short distances without assistance? _____
2. Can patient eat without assistance? _____
3. Can patient dress without assistance? _____

Comment:

SPEECH AND LANGUAGE: (Check whatever is appropriate.)

1. Does the patient emit any of the following behavioral evidence of aphasia?

A. _____ Increased latencies between presentation of spoken or written verbal messages to the patient and his/her responses to those messages.

B. _____ Emission of appreciable numbers of corrected error responses. (Does patient appear to need to hear or see his/her error before it is

corrected? - Inability to anticipate errors and correct them before an error response occurs appears to be related to disruption of internalized monitoring and control of language output.) If possible, note errors:

- C. _____ Performance gets worse during speech and language tasks.
- D. _____ Performance seems to recover with rest.
- E. _____ Performance deteriorates abruptly when new tasks are administered (and then slowly improves), suggesting difficulty in establishing new response sets.
- F. _____ Patient seems to miss initial portions of incoming verbal materials (e.g., first few words in a sentence or paragraph).
- G. _____ Patient asks for repetition even though no other evidence of hearing difficulty is present.
- H. _____ Weakness noted in one or more of the following modalities (check appropriate modality [ies]):
- _____ -understanding speech
 - _____ -reading to self silently
 - _____ -writing
 - _____ -spelling
 - _____ -speaking
- I. _____ Patient displays one or more of the following (check whichever applies):
- _____ -echoialia
 - _____ -mirror reversals in writing
 - _____ -misarticulated speech
 - _____ -paraphasias (i.e., substitution of incorrect words or sounds for their correct versions)
 - _____ -perseveration
 - _____ -slurred speech
 - _____ -word finding problems
- J. _____ Patient seems hyperverbal.
- K. _____ Patient does not complete tasks without continual reminders and/or encouragement.

**MENTAL STATUS ASSESSMENT
AND FUNCTIONAL COMPETENCE IN
GERIATRIC POPULATIONS**

CLINICAL IMPRESSIONS - PHYSICIANS' FORM

Your input is requested to determine whether the following patient is appropriate for inclusion in a study designed to investigate the relationship between mental status and functional behavior. Subjects in this study will be administered a protocol consisting of a number of mental status instruments. Total administration time will be approximately 40 minutes. Information regarding functional (adaptive) behavior will be gathered from the patient's family, the patient, and staff members. Every third subject will be provided with direct ADL assessment. By providing the following information, you will help assure that our conclusions about current mental status do not reflect a transitory medical situation. In addition, your input will assure that no patient with tenuous medical status is involved in the study.

Patient Name: _____ SS#: _____

Physician Reporting: _____ Date of Staffing: _____

LEVEL OF CONSCIOUSNESS: (Check one)

MEDICATIONS PERTINENT
TO MENTAL STATUS

1. Alert _____
2. Lethargic/somnolent _____
3. Stuporous/semicomatose _____
4. Comatose _____

- 1.
- 2.
- 3.
- 4.

Comment: _____

Comment: _____

MEDICAL CONDITION: Does the patient present with an acute medical condition which would preclude his/her participation in the study at this time? Examples of such a condition include delirium secondary to infection, generalized weakness, need for isolation due to contagious situation, severely impaired cardiac and/or pulmonary function, etc.

Please check one:

_____ The patient displays no acute medical condition which would make participation in the study inappropriate.

_____ The patient displays the following acute medical condition which would make participation in the study inappropriate: _____

HEARING: (Check one)

1. Clear, no problems discerned. _____
2. Hears adequately with compensation (e.g., increased volume from E. and/or hearing aid). _____
3. Clearcut difficulties regardless of compensation. _____

Comment: _____

Clinical Impressions - Physicians' Form, p. 2

VISION: (Check one)

1. Sees well enough to read and recognize faces in the room without lenses (adequate level of light assumed). _____
2. Sees well enough to read and recognize faces with lenses. _____
3. Obvious difficulty with one or the other visual activity with lenses. _____
4. Cannot do one or both activities despite use of lenses. _____

Comment:

MOTOR FUNCTIONING: (Indicate yes or no.)

1. Can patient ambulate short distances without assistance? _____
2. Can patient eat without assistance? _____
3. Can patient dress without assistance? _____

Comment:

Appendix B. Information Presented
to Subjects and Agreement to
Participate in Research Forms

Information About
MENTAL STATUS ASSESSMENT AND FUNCTIONAL COMPETENCE
IN GERIATRIC POPULATIONS

A. PURPOSE OF THE STUDY

1. In general we are interested in determining how older persons' skills in the areas of attention, concentration, memory and judgment affect their ability to continue to take care of themselves.
2. Specifically, we would like to find out if the results of several cognitive tests can be used to accurately predict a person's ability to manage his/her daily affairs.

B. PROCEDURES TO BE USED

1. You will spend about 30 to 40 minutes with a researcher, who will ask you a number of questions designed to see how alert you are and to check your attention, concentration, memory, and some language skills. All information given by you is confidential.
2. Your physician, a nurse, and/or a family member will be asked to respond to some questions related to how well you have been doing at home. This information is also confidential.
3. Every third person involved in this study will be asked to demonstrate a number of basic self-care skills such as washing, cleaning, cooking, grooming, etc. This procedure will occur in private on this unit and will last about 20-30 minutes. The results again are confidential. Please note that taking part in this portion of the research is very important and helpful for us, as it allows us to check the validity of various tests we typically give to patients on units like this one.

C. KNOWN RISKS, INCONVENIENCES OR SIDE-EFFECTS THAT CAN BE EXPECTED

1. None of the procedures involve pain, embarrassment, or risk of injury.
2. All information gathered in this study is confidential.

D. POTENTIAL BENEFITS TO YOU AS A PARTICIPANT

1. You will be seen by several professionally trained people who will be able to provide your physician with additional information, which may be pertinent to your medical situation and which may pertain to diagnosis, treatment, and follow-up care.
2. During this contact, you will be able to express concerns about your hospital situation. If you so desire, these concerns will be communicated to your physician.

3. Your participation will contribute to our understanding of the relationship of one's thinking skills and one's ability to take care of oneself on a daily basis. You will also help to determine how valid several tests are for diagnosing dementia.

E. OTHER CONDITIONS OF PARTICIPATION

1. Your participation is entirely voluntary and you may withdraw at any time without negative consequences.
2. If you have questions about the study or about your participation, you may call Greg Mayer at 582-1565, ext. 1747, or Dr. Todt at ext. 1930.

**PART I-AGREEMENT TO PARTICIPATE IN RESEARCH
BY OR UNDER THE DIRECTION OF THE VETERANS ADMINISTRATION**

DATE

I, _____, voluntarily consent to participate as a subject in the investigation entitled _____.

(Type or print subject's name) (Title of study)

2. I have signed one or more information sheets with this title to show that I have read the description including the purpose and nature of the investigation, the procedures to be used, the risks, inconveniences, side effects and benefits to be expected, as well as other courses of action open to me and my right to withdraw from the investigation at any time. Each of these items has been explained to me by the investigator in the presence of a witness. The investigator has answered my questions concerning the investigation and I believe I understand what is intended.

3. I understand that no guarantees or assurances have been given me since the results and risks of an investigation are not always known beforehand. I have been told that this investigation has been carefully planned, that the plan has been reviewed by knowledgeable people, and that every reasonable precaution will be taken to protect my well-being.

4. In the event I sustain physical injury as a result of participation in this investigation, if I am eligible for medical care as a veteran, all necessary and appropriate care will be provided. If I am not eligible for medical care as a veteran, humanitarian emergency care will nevertheless be provided.

5. I realize I have not released this institution from liability for negligence. Compensation may or may not be payable, in the event of physical injury arising from such research, under applicable federal law.

6. I understand that all information obtained about me during the course of this study will be made available only to doctors who are taking care of me and to qualified investigators and their assistants where their access to this information is appropriate and authorized. They will be bound by the same requirements to maintain my privacy and anonymity as apply to all medical personnel within the Veterans Administration.

7. I further understand that, where required by law, the appropriate federal officer or agency will have free access to information obtained in this study should it become necessary. Generally, I may expect the same respect for my privacy and anonymity from these agencies as is afforded by the Veterans Administration and its employees. The provisions of the Privacy Act apply to all agencies.

8. In the event that research in which I participate involves certain new drugs, information concerning my response to the drug(s) will be supplied to the sponsoring pharmaceutical house(s) that made the drug(s) available. This information will be given to them in such a way that I cannot be identified.

I _____
NAME OF VOLUNTEER

HAVE READ THIS CONSENT FORM. ALL MY QUESTIONS HAVE BEEN ANSWERED, AND I FREELY AND VOLUNTARILY CHOOSE TO PARTICIPATE. I UNDERSTAND THAT MY RIGHTS AND PRIVACY WILL BE MAINTAINED. I AGREE TO PARTICIPATE AS A VOLUNTEER IN THIS PROGRAM.

9. Nevertheless, I wish to limit my participation in the investigation as follows:

AP FACILITY	SUBJECT'S SIGNATURE
WITNESS'S NAME AND ADDRESS (Print or type)	WITNESS'S SIGNATURE
INVESTIGATOR'S NAME (Print or type)	INVESTIGATOR'S SIGNATURE

Signed information sheets attached. Signed information sheets available at:

SUBJECT'S IDENTIFICATION (I.D. plate or give name - last, first, middle)

SUBJECT'S I.D. NO.

READ

AGREEMENT TO PARTICIPATE IN
RESEARCH BY OR UNDER THE DIRECTION
OF THE VETERANS ADMINISTRATION

VA FORM 10-1086
SEP 1978

SUBJECTS VA FORM 10-1086-1
AUG 1978, WHICH WILL NOT
USED.

PART II - AGREEMENT BY SUBJECT'S REPRESENTATIVE TO ALLOW SUBJECT TO PARTICIPATE IN RESEARCH BY OR UNDER THE DIRECTION OF VETERANS ADMINISTRATION

2-16

I, _____ am authorized to give consent:
 (Type or print name of subject's representative)

_____ by virtue of _____
 (Type or print subject's name) (Relationship, legal appointment, etc.)

voluntarily consent for this person to participate as a subject in the investigation entitled _____
 (Title of study)

- 1. I have signed one or more information sheets with this title to show that I have read the description including the purpose and nature of the investigation, the procedures to be used, the risks, inconveniences, side effects, and benefits to be expected, as well as other courses of action open to me and my right to withdraw the subject from the investigation at any time. Each of these items has been explained to me by the investigator in the presence of a witness. The investigator has answered my questions concerning the investigation and I believe that I understand what is intended.
- 2. I understand that no guarantees or assurances have been given me since the results and risks of an investigation are not always known beforehand. I have been told this investigation has been carefully planned, that the plan has been reviewed by knowledgeable people, and that every reasonable precaution will be taken to protect the well-being of the subject.
- 3. In the event the subject sustains physical injury as a result of participation in this investigation, if the subject is eligible for medical care as a veteran, a necessary and appropriate care will be provided. If the subject is not eligible for medical care as a veteran, humanitarian emergency care will nevertheless be provided.
- 4. I realize I have not released this institution from liability for negligence. Compensation may or may not be payable, in the event of physical injury arising from such research, under applicable federal laws.
- 5. I understand that all information obtained about the subject during the course of this study will be made available only to doctors who are taking care of the subject and to qualified investigators and their assistants where their access to this information is appropriate and authorized. They will be bound by the same requirements to maintain the subject's privacy and anonymity as apply to all medical personnel within the Veterans Administration.
- 6. I further understand that, where required by law, the appropriate federal officer or agency will have free access to information obtained in this study should it become necessary. Generally, I may expect the same respect for the subject's privacy and anonymity from these agencies as is afforded by the Veterans Administration and its employees. The provisions of the Privacy Act apply to all agencies.
- 7. In the event that research in which the subject participates involves certain new drugs, information concerning the subject's response to the drug(s) will be supplied to the sponsoring pharmaceutical house(s) that made the drug(s) available. This information will be given to them in such a way that the subject cannot be identified.

I, _____
 NAME OF SUBJECT'S REPRESENTATIVE

HAVE READ THIS CONSENT FORM. ALL MY QUESTIONS HAVE BEEN ANSWERED, AND I FREELY AND VOLUNTARILY CHOOSE THAT THE SUBJECT PARTICIPATE. I UNDERSTAND THAT THE SUBJECT'S RIGHTS AND PRIVACY WILL BE MAINTAINED. I AGREE TO THE SUBJECT'S PARTICIPATION AS A VOLUNTEER IN THIS PROGRAM.

Nevertheless, my consent for the subject's participation in the investigation is limited as follows:

ADDRESS OF SUBJECT'S REPRESENTATIVE (Print or type)	SIGNATURE OF SUBJECT'S REPRESENTATIVE
WITNESS'S NAME AND ADDRESS (Print or type)	WITNESS'S SIGNATURE
SUBJECT'S NAME (Print or type)	SUBJECT IS NOW A PATIENT AT (Name of VA Facility)
INVESTIGATOR'S NAME (Print or type)	INVESTIGATOR'S SIGNATURE

Signed information sheets attached. Signed information sheets available at:

SUBJECT'S IDENTIFICATION (I.D. Print or print name - last, first, middle)	SUBJECT'S I.D. NO.	AGE	RACE
---	--------------------	-----	------

AGREEMENT BY SUBJECT'S REPRESENTATIVE TO PARTICIPATE IN RESEARCH BY OR UNDER THE DIRECTION OF THE VETERANS ADMINISTRATION

VITA

Gregory Lee Mayer

Home:
195 East Girard
Salt Lake City, UT 84103
(801) 486-3240

Office:
NeuroCare Villa Serena
8265 West 2700 South
Magna, Utah 84044
(801) 250-8400

Education:

Washington University, St. Louis	A.B.	1970	Psychology & English Literature
Washington University, St. Louis	M.A.	1972	Counseling Psychology
Southern Illinois University- Edwardsville	Graduate Coursework	1979- 1981	Clinical Psychology
Utah State University	Ph.D.	1989-	Professional- Scientific Psychology Program (Clinical Specialization) (APA Approved)

Certification:

Missouri Life Certification: Secondary School Counseling; Language Arts

Honors and Awards:

Washington University:	Academic Scholarship: 1966-70 Freshman, Sophomore Honors Dean's List Phi Eta Sigma, Scholastic Honorary Kappa Delta Pi, National Honor Society in Education
Southern Illinois University:	Psi Chi, National Honor Society in Psychology
Utah State University:	University Fellowship: 1981-82 University Scholarship: 1983-84 Who's Who Among Students in American Colleges and Universities, 1983

Professional Experience:

- 1987- Neuropsychology Resident - NeuroCare Villa Serena (comprehensive transitional living center for head injured adults).
- 1986- Psychology Technician - Cognitive Rehabilitation
1987 Research Project, Research Service, Salt Lake City VA Medical Center.
- 1986- Research Assistant - Geriatrics Evaluation and
1987 Treatment Unit, Psychology Service, Salt Lake City VA Medical Center.
- 1986- Administrator, Group Tests - University of Utah
1987 Testing Center.
- 1986 Consultant - Psychological and psychoeducational assessment, University Affiliated Developmental Center for the Handicapped, Utah State University.
- 1986 Instructor - Educational Psychology, Utah State University Extension Division.
- 1984- Clinical Predoctoral Intern - Geriatrics, Neurology
1985 and Medicine, Psychology Service, Salt Lake City VA Medical Center
- 1982- Intern in Psychology - Clinical Services, Division
1984 of Services, University Affiliated Exceptional Child Center, Utah State University. (This agency has since been renamed the Developmental Center for the Handicapped).
- 1979- Research Assistant - Internal Program Review, Graduate
1981 School, Office of the Dean, Southern Illinois University-Edwardsville.
- 1979 Guidance Counselor - Nipher Middle School, Kirkwood R-7 School District, Kirkwood, Missouri.
- 1976- Staff Member: Camp Epworth-Among-the Hills, Arcadia,
1979 Missouri; Camp Wyman, Eureka, Missouri.
- 1973- Language Arts Teacher - Nipher Middle School, Kirkwood
1979 R-7 School District, Kirkwood, Missouri.

1972- Core Curriculum Teacher (Language Arts, Social
1973 Studies) 7th Grade - Nipher Junior High School,
Kirkwood R-7 School District, Kirkwood, Missouri.

Professional Memberships

International Neuropsychological Society (associate)
Midwestern Psychological Association (student affiliate)

Papers and Presentations

Mayer, G. L. (1989). Psychosocial issues of traumatic brain trauma: The transitional living center perspective. Paper presented at the Western Rehabilitation Institute conference: "Working Together For Maximal Recovery - Facing the Psychosocial Challenges Through the Rehabilitation Process and Beyond." Salt Lake City, Utah, January, 1989.

Mayer, G. L. (1988). Neuropsychological issues and vocational rehabilitation of the traumatically brain injured client. Paper presented at the Annual Inservice of the Utah State Division of Vocational Rehabilitation, Salt Lake City, September, 1988.

Gummow, L. J., Dustman, R. E., Keaney, R. P., Gregory, V. R., & Mayer, G. L. (1986). Electrophysiological Evaluation of Cerebral Efficiency After Stroke. Paper presented at the National Experimental Research and Development Office Conference, Las Vegas, December, 1986.

Mayer, G. L. (1985). Post-Traumatic Stress Disorder: Diagnostic, Treatment and Ethical Considerations. Psychology Service Clinical Case Conference Series, Salt Lake City VA Medical Center, Salt Lake City, Utah, March, 1985.

Mayer, G. L. & Sturgis, L. (1982). Workshop in Assertiveness Training. Office Occupations Training Program, Utah State University, Logan Utah.

Taylor, L. J., & Mayer, G. L. (1979). Using Behavioral Approaches to Discipline in the Classroom. Missouri Middle School Conference, 1979.

Diehl, T. T., Hassler, T., & Mayer, G. L. (1976). Developing Active Listening Skills for Faculty and Staff. Webster University, St. Louis, Missouri.

Unpublished Manuscripts

Gummow, L. J., Dustman, R. E., Keaney, R. P., Mayer, G. L., & Gregory, V. R. (In preparation). Quantitative EEG Parameters and Late Stroke Recovery.

Mayer, G. L., Marvel, K., & Cole, P. (In preparation). Gender Identity Disorder: Ethical, Diagnostic and Treatment Issues.

Current Research Interests

Neuropsychological assessment and brain injury; cognitive assessment of geriatric individuals; cognitive and psychological rehabilitation of stroke patients; gender identity disorder: ethical, diagnostic and treatment issues.

Hobbies and Interests

Music: piano, composition.

Outdoor activities: backpacking, camping, canoeing, skiing.

Pets: two cats.

Photography: informal portrait, landscape, travel.

Sports: basketball, Tae Kwon Do (Black Belt, 1st Dan), volleyball.

Travel.