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Maureen Marks Cash

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CORRELATES OF DEMENTIA AND DEPRESSION IN THE ABLE ELDERLY

By

Maureen Marks Cash

A DISSERTATION

Submitted to
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ABSTRACT

CORRELATES OF DEMENTIA AND DEPRESSION IN THE ABLE ELDERLY

By

Maureen Marks Cash

The present study compared three groups of able elderly
(i.e., those who live independently in the community): (1)
mildly demented group, (2) mildly depressed group, and (3)
normal controls. They were compared on the basis of memory
function, memory complaints and reported
psychological/behavioral function. One hundred and forty-
six individuals participated in this project. The test
battery included a structured interview, memory assessment,
and mental health assessment questionnaires. Scores from a
brief battery measuring evidence of dementia (Storandt,
Botwinick, Danziger, Berg, and Hughes, 1984) and two
depression measures (Geriatric Depression Scale and Hamilton
Rating Scale for Depression) were used to assign
participants to the aforementioned groups. They were then
compared based on their scores from the Brief Symptom
Inventory (the psychological/behavioral measure), the
Selective Reminding Test (the memory function measure), and
a portion of the Multilevel Assessment Instrument (the
memory complaints measure). It was found that depressed
participants had significantly more memory complaints than
the control group. The demented subjects were not different
from either of the other groups on this variable. The

depressed group and the demented group differed on only three symptom dimensions (depression, paranoid ideation, and psychoticism) while the demented and control group only differed on two dimensions (somatization and phobic anxiety). The depressed and control groups significantly differed on all symptom dimensions. Based on global symptomatology, it was found that the depressed group differed from the demented group on number of symptoms reported and general severity, but not on pure intensity of symptoms. The demented group differed from the control group on only the pure intensity measure. The demented group was found to perform significantly worse on all long term memory functions than either group, but no differently on short term recall. There were no memory function differences found between the depressed and the control groups. It was found that among the variables, reported symptomatology and memory complaints predicted most effectively for depressed group status while the long term memory scores predicted best for demented group status.

This work is dedicated to my husband, Bret, whose faith in me never wavered even when mine did, and to my parents, Allan and Sharon Marks, who always told me I could be whatever I wanted. I'm glad I listened.

ACKNOWLEDGEMENTS

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INTRODUCTION

Definitions of Dementia

There have been various attempts to define dementia in such a way that it can be easily distinguished from other disorders (e.g. McLean, 1987; Janowsky, 1982; Esser & Vitaliano, 1988). In a review by McLean (1987), two major classifications systems were noted. The first was found in the Research Diagnostic Criteria (RDC: Eisdorfer & Cohen, 1980). In order to diagnose an individual as demented the following criteria had to be met: "(1) impairment of at least two of the following abilities: learning, attention, memory, or orientation. (2) impairment of at least one of the following cognitive skills: calculation, abstraction and judgment, or comprehension. (3) problems in at least one of the following areas: ability to work, function socially, and relate to family and peers. (4) cerebral dysfunction as indicated by either cerebral atrophy on CT scan or abnormal EEG."(p.554) While these criteria delineate to some degree the areas in which impairment must exist, they do not make specific the exact nature or extent of these impairments. They also do not address mood or personality changes that may also accompany the dementing process and impact on diagnosis.

The second major system to which McLean refers is the DSM-III diagnosis of dementia (American Psychiatric

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Association, 1980). The DSM-III delineates criteria for this syndrome as follows: "(1) loss of intellectual abilities of sufficient severity to interfere with social or occupational functioning. (2) memory impairment. (3) at least one of the following: impairment of abstract thinking, impaired judgment, disturbance of higher cortical function, and personality change. (4) no clouding of consciousness. (5) other non-organic conditions have been reasonably excluded and the behavior change represents cognitive impairment in a variety of areas."(p.111-112) These criteria are more specifically defined in that they give some clue as to the severity of intellectual impairment necessary for diagnosis. The DSM-III criteria also mention the importance of personality change and exclusion of psychological causes. However, this definition is also somewhat general in scope. What changes in personality would warrant a diagnosis of dementia? What kind(s) of memory impairment should clinicians look for to determine whether their patients have the relevant cognitive deficits? Other criticisms include the lack of empirical support for these criteria, and the lack of dimensionality to them (Jorm & Henderson, 1985). Neither of these systems addresses the problem of levels of severity, particularly for mild dementia. Jorm and Henderson (1985) point out that this problem is especially pertinent for studies using community samples as opposed to clinical populations because it is

much more likely that the milder forms of dementia will predominate in a community population.

To deal with the difficulties involved in distinguishing memory changes due to early dementia from those due to normal aging, a new "diagnostic" category has been suggested: age-associated memory impairment (AAMI: Crook, Bartus, Ferris, Whitehouse, Cohen, & Gershon, 1986). The criteria for inclusion are: (1) over 50 years of age, (2) gradual worsening of memory with complaints of memory loss in everyday situations, (3) memory test performance one standard deviation below mean for young adults, (4) evidence of adequate intellectual function, and (5) absence of evidence of dementia (i.e., >24 on Mini-Mental State Exam). These criteria were designed to describe older people who have no evidence of neurological impairment, but have complaints about their memory function and show changes in memory that could be of "functional significance" (Smith, Ivnek, Petersen, Malec, Kokmen, & Tangalos, 1991). Unfortunately, as presently proposed these criteria show poor reliability in samples of able elderly. It has been found that the rates of AAMI diagnosis are widely variable depending upon the number and type of memory tests used (Smith, et al., 1991).

These are some of the major problems involved in making accurate diagnosis of dementia; even the criteria which are supposed to operationalize it may be of insufficient use to

the practicing clinician. It seems reasonable that more empirical work needs to be done in order to make more reliable and valid diagnoses.

GENERAL EFFECTS ON COGNITIVE FUNCTION

Many studies have noted the effects that a dementing process can have on the cognitive function of the individual as well as the importance for accurate detection of these cognitive dysfunctions (e.g., Lazarus, Newton, Cohler, Lesser, & Schweon, 1987; Vitaliano, Breen, Albert, Russo, & Prinz, 1984; and Cohen & Dunner, 1980). Lazarus et al. (1987) found that when comparing demented patients with healthy individuals, the demented subjects were rated as significantly more cognitively impaired. Another study examined the cognitive performance (attention and memory) patterns of mildly to moderately demented elderly compared to normal, healthy elderly (Vitaliano et al., 1984). These investigators found that control subjects performed significantly better than the mildly demented group in performance of complex commands, immediate recall, and calculations. The control subjects were also significantly better oriented to time and place than the mildly demented group. Winogrond & Fisk (1983) found similar results in testing a group of elderly people in a day care setting for Alzheimer's patients. It was found that on a test of orientation all patients scored in the moderately to the severely "defective" range. The overall cognitive

assessment showed no patient achieving better than a rating of moderate dysfunction.

These studies suggest that in comparison to normal elderly individuals, the demented elderly score significantly worse on measures of cognitive function, and can be fairly easily distinguished from a healthy group.

GENERAL EFFECTS ON MEMORY FUNCTION

Along with cognitive difficulties, memory function in the demented elderly has been shown to be equally affected by this progressive disorder (McLean, 1987; Harris & Dowson, 1982; Kopelman, 1986; Miller, 1973; Miller, 1975). Janowsky (1982) reported that in the early stages of dementia, the first indications of problems almost always include lapses in memory. He stated that the individual "cannot remember specific pieces of information that were once easily recalled (e.g., names, places, dates, or words)." In many ways, the early stages of dementia may be hard to distinguish from what could be viewed as the normal effects of aging. However, it has been found in longitudinal studies that once individuals' reach their sixties observed declines in memory functioning are often a result of changes in health status as opposed to normal aging (Siegler, 1983).

If one examines specific memory functions, differences between the effects of dementing and normal processes begin to emerge. McLean (1987) reported that patients with primary dementia tend to have poor recent memory in

comparison with remote memory and have no gaps in their memories. It was also noted that patients with dementia tend to perform worse on tests of general memory than on tests of concentration. Other studies also support the finding of poor recent memory in the demented through their investigations of short-term memory capacity (e.g. Miller, 1972; Hughes, Berg, Danziger, Coben, & Martin, 1982; Gershon & Herman, 1982; Kopelman, 1985; Kopelman, 1986; Miller, 1980). Miller (1972; 1973) found that demented patients do poorly on word recall tests as compared to normal subjects. Normal elderly were found to be able to recall a significantly larger number of words from a given list. Miller interpreted this to mean that individuals with a dementing disorder have a reduced capacity in their short-term memory. In this experiment, lists were repeated over and over adding one new word each time as long as the subject could recall the previous words. Because long-term memory capacity is also needed in order to be successful, Miller suggested that the demented person's ability to "establish new material in long-term memory" was also impaired. However, in a later study by Miller (1975), it was found that the demented were able to attain levels of recall similar to those of normal subjects when an appropriate cue (initial letter of word) was given. Miller interpreted this to mean that long-term memory difficulties may be due to a problem with retrieval rather than with

encoding new information into long-term storage. This
interpretation was examined in work done by Davis and
Mumford (1984). Their hypothesis was that if retrieval is
the problem in dementia than demented subjects should get
significantly greater benefit from any kind of cue than
should normal subjects. However, they found that not only
was there similar benefits for both groups from cues in
general, but that only certain kinds of cues (letter rather
than category) aided the demented group. These authors
suggested that there may also be a processing problem
responsible for poorer recall in demented patients; that is,
information can be placed into long-term memory, but is
encoded is such a way that normal retrieval methods are much
less effective. Davis and Mumford came to the conclusion
that demented patients likely have difficulties at both
encoding and retrieval stages of information processing.

EFFECTS ON PSYCHOLOGICAL STATE AND BEHAVIOR

Studies also indicate that dementia is often
accompanied by changes in psychological state and/or
behavior (e.g., Gershon & Herman, 1982; McLean, 1987;
Janowsky, 1982; Miller, 1980; Lazarus et al., 1987). Miller
(1980) notes that "characteristic disturbances" of mood have
been cited throughout the literature on dementia in the
elderly. Several studies cite irritablity, withdrawal,
denial, fear, anxiety, depression, helplessness,
hopelessness, and worthlessness as common mood states for

the demented individual (Rubin, Morris, & Berg, 1987; Lazarus et al., 1987; Merriam, Aronson, Gaston, Wey, & Katz, 1988; Teri, Larson, & Reifler, 1988; Cohen & Dunner, 1980). Gershon and Herman (1982) report that family members of demented elderly often complain that their relative has become "restless, agitated, argumentative, and suspicious" before any truly significant cognitive impairment is evident. Nott and Fleminger (1975) compared two psychiatric populations: one with evidence of dementia and another without. It was found that lability of mood and irritability were symptoms more often found in the demented group than in the non-demented group. Similar findings have been confirmed elsewhere (Knesevich, Martin, Berg, & Danziger, 1983; Rabins, Merchant, Nestadt, 1984).

Data from the Seattle Longitudinal Study of Aging has suggested that in normal aging the individual's behavioral and attitudinal flexibility changes as s/he advances in years. It has been found that there is moderately increasing rigidity in style as participants reached their sixties (Schaie & Willis, 1991). This could have an adverse effect on the individual's ability to adapt to changes in his/her mental status.

There has been some debate in the literature as to the prominence of depressive symptoms in the dementing process. Some studies have shown that demented individuals show significantly higher levels of depression than that of

normal subjects (e.g., Shuttleworth, Huber, & Paulson, 1987; Lazarus et al., 1987). However, a study by Knesevich et al. (1983) found that while their demented group did score significantly higher for depressive symptoms than did a control group, both groups were well within the nondepressed range. This has been supported elsewhere as well (Gottlieb, Gur, & Gur, 1988). However, if memory impairment is mild, then the losses might be made light of or defended against in some way so depression does not become a major factor (Salzman & Gutfreund, 1986).

Some work has also been done suggesting that depressive symptoms may be related to the severity of the dementia. Reifler, Larson, and Hanley (1982) found that RDC depressive symptoms were typically more common in the beginning stages of the process, and significantly less in the more severely impaired patients. Reasons for differing results regarding the prominence of depression in dementia include the use of differing criteria to determine depression and the use of observer vs. participant ratings, but these issues will be discussed in greater detail later.

Obsessional symptoms and paranoia, which have also been noted as prominent in the dementing process, may exist as coping mechanisms (e.g., Rubin et al., 1987; Merriam et al., 1988; Janowsky, 1982; McLean, 1987). As patients become aware of increasing cognitive deficits, they may try to compensate by keeping track of tasks that have been or need

to be done by writing copious notes for themselves and
relying on other kinds of "external props" (Janowsky, 1982;
Fopma-Loy, 1986). Studies indicate that subclinical levels
of obsessional symptoms may be common in people experiencing
cognitive deficits (Sher, Frost, Kushner, Crews, &
Alexander, 1989; Sher, Mann, & Frost, 1984; Sher, Frost, &
Otto, 1983). Individuals who show subclinical obsessive
checking behavior report "higher frequencies of failures of
everyday memory and cognitive functioning," and also score
significantly lower on memory tests than noncheckers (Sher
et al., 1984). These results have been found to be true for
psychiatric as well as nonpsychiatric populations of varying
ages (Sher et al., 1984; Sher et al., 1989). Sher et al.
(1989) also found that "checkers" indicated greater general
distress on psychological symptom measures. These findings
can be viewed as further evidence for the reports of
significant obsessive-compulsive symptoms in the demented
elderly.

ROLE OF DEPRESSION IN DEMENTIA

The ability to differentially diagnose between dementia
and depression (sometimes called "pseudodementia") in the
elderly has long been a thorn in the side of the medical and
psychological professions. There are various reasons why it
has proven so difficult to make accurate, early diagnosis.
Probably the most troublesome one is the existence of
overlapping symptoms that occur in both of these disorders

in older adults. These include psychomotor retardation, fatigue, hopelessness, worthlessness, loss of interests, withdrawal, irritability, memory loss, and cognitive impairment (e.g., Esser & Vitaliano, 1988; Gershon & Herman, 1982; Janowsky, 1982; Jorm, 1986; Kim & Hershey, 1988; Shamoian, 1985; Straker, 1984). Another difficulty in accurate diagnosis is that although the depressed elderly may often complain about symptoms seen in depressives of various ages, there may just as often be stereotypic symptoms which are conspicuously absent from the picture (e.g., McLean, 1987; Janowsky, 1982; Gershon & Herman, 1982; Shamoian, 1985). For example, an elderly depressed patient might not speak directly about feelings of sadness and despair. They might not talk about guilt feelings, lower self-esteem, or suicidal thoughts, and often the depression is expressed in the form of somatic complaints (Janowsky, 1982). Thus evidence of cognitive impairment or complaints of memory loss might take on greater diagnostic importance in depression in the elderly.

Cognitive impairment has often been cited as possible evidence of depression in the elderly, and has led to the term "pseudodementia" to describe this condition (e.g., Esser & Vitaliano, 1988; Janowsky, 1982; Gershon & Herman, 1982). A number of investigators have found that memory and cognitive impairment is significantly worse in depressive elderly than in age-matched controls, and that the level of

impairment was associated with the degree of depression
(Whitehead, 1973; Weingartner, Cohen, Murphy, Martello, &
Gerdt, 1981; Cohen, Weingartner, Smallberg, Pickar, &
Murphy, 1982). Other studies have confirmed that depressive
elderly subjects do perform statistically worse on cognitive
testing compared to healthy age-matched controls but note
that the degree of impairment was actually fairly small.
Moreover these studies failed to find an association between
degree of impairment and severity of the depression
(Coughlan & Hollows, 1984; Kopelman, 1986).

It has also been suggested that depressed elderly
patients tend to complain of memory losses for both recent
and past events even though these were not obvious to the
examiner while truly demented persons try to play down their
memory deficits. These kinds of memory and cognitive
deficits appear to be accentuated by elderly depressed
individuals (Gershon & Herman, 1982; Esser & Vitaliano,
1988; Fopma-Loy, 1986; McLean, 1987). Miller (1980)
corroborates this finding stating that "aged individuals
with clinical depression complained about memory as much as
those with altered brain function, even though the latter
showed far more severe impairment on objective tests of
memory." Thus, it may be that in "pseudodemented"
individuals, cognitive impairment as assessed by self-report
might be more apparent than real.

In addition to greater number of memory complaints, other clinical features that may aid in distinguishing between "pseudodementia" and primary dementia have been noted in the literature. Earlier it was noted that demented individuals tend to have greater memory loss for recent than for remote events, to have few memory gaps, and perform consistently poorer on cognitive tasks. By contrast, pseudodemented individuals tend to have equally severe losses for recent and remote events, have specific memory gaps, and show variability in performance on cognitive tasks (Kim and Hershey, 1988; Kramer, 1982). It has also been noted that depressed elderly have difficulty recalling new information, make an increased number of errors of omission, take fewer guessing risks in tasks, and have decreased attentional abilities, but are typically without impairment in other aspects of cognitive function (Salzman & Gutfreund, 1986). Weingartner, Cohen, Bunney, Jr., Ebert, and Kaye (1982) reported a study that found elderly in the early stages of dementia have trouble organizing, producing, and making use of verbal material, while depressed elderly tended to maintain these skills.

With respect to psychological symptoms, demented individuals tend to show lability and greater irritability while depressed individuals are more consistently discouraged and have poorer self-image than demented persons (Janowsky, 1982). Unfortunately, there are far fewer

studies which examine whether there are distinguishable psychological and behavioral symptom constellations between these two populations.

While it seems that many authors in this field have accepted the term "pseudodementia" as appropriate for the condition described above, there are those who find this language to be less than precise. Some have stated that this term is misleading because there may be an actual organic basis to a dementing disorder which is precipitated by depression (Folstein & McHugh, 1978; McAllister, 1983). Another major problem seen with this term is that it apparently denies the possibility that depression and dementia could co-exist within the same individual and that this co-existence could be the condition that has been labelled "pseudodementia" (Reifler et al., 1982; McAllister & Price, 1982).

However, one thing is clear - it is of the utmost importance to establish an appropriate initial diagnosis. There is some evidence that persons diagnosed with dementia live only three years beyond the initial diagnosis while nondemented individuals of the same age live approximately six years longer (Steel & Feldman, 1979). If depression is correctly diagnosed, appropriate treatment can be initiated. If it is not, institutionalization, "progressive invalidism," and possibly death can be the result (Kramer, 1982).

Although there do seem to be many similarities between the presentations of demented and depressed elderly people, it does appear that there may be ways of distinguishing between them clinically. It has been noted that it is easier to make differential diagnoses in elderly persons who are under the age of 80 and are mildly to moderately depressed than in persons over 80 and/or severely depressed (Salzman & Gutfruend, 1986). However, the literature suggests that there currently are no tests which can unequivocally differentially diagnose these disorders (Shamoian, 1985). Diagnoses at this time tend to be made on the basis of the individual's medical and psychosocial history, the physician's clinical observations, and the person's therapeutic response to anti-depressants.

Unfortunately there is evidence that diagnoses of dementia made based on medical records can often lead to misclassification. Of research done with 27 participants in the Baltimore Longitudinal Study of Aging who had been retrospectively classified as demented based on prior medical records, twelve were later found to perform on cognitive measures in a manner inconsistent with this diagnosis (Arenberg, 1990). This finding emphasizes the importance of developing and using empirical means to appropriately diagnose individuals.

MEASURES OF COGNITIVE FUNCTION

It was noted earlier that it is of great importance for clinicians to accurately diagnose the presence of depression or dementia in the elderly. This can be done by providing evidence that there are qualitative differences in the types of cognitive deficits involved in each condition (Jorm, 1986). Hughes et al. (1982) believe this is particularly important in distinguishing mildly demented persons from depressed or normal individuals because the use of neuropathologic studies has proven ineffective in identifying early dementia.

One of the most widely used measures of cognitive impairment is the Mini-Mental State Examination (MMS: Breen et al., 1984; Cohen & Dunner, 1980; Esser & Vitaliano, 1988; Heyman, Wilkinson, Hurwitz, Helms, Haynes, Utley, & Gwyther, 1987; McLean, 1987; Teri et al., 1988; Vitaliano et al., 1984;). The MMS is composed of 30 questions which are divided into two sections: (1) orientation, memory and attention and (2) object recognition and ability to understand and accurately follow verbal and written instructions (Folstein, Folstein, & McHugh, 1975). It has been found to correlate well with the DSM-III criteria for dementia (Kay, Henderson, Scott, Wilson, Rickwood, & Grayson, 1985). However, it can be significantly influenced by education and age of subjects, thus making matched samples critical (Folstein et al., 1975). Most studies use

a criterion score of less than 24 as a diagnosis for dementia when the subject is alert and making an effort (e.g., Breen, et al., 1984; Heyman et al., 1987; Rabins et al., 1984). One study used 3 ranges to define severity of dementia on the MMS: scores of 26-30 were normal, 20-25 were considered mildly demented, 15-19 were considered moderately demented, and 5-14 were considered severely demented (Shuttleworth, Huber, & Paulson, 1987).

In distinguishing mildly demented elderly from age-matched controls, it has been found that the demented group does significantly worse on the three-step command, serial sevens, and time/place orientation indicating that there are patterns of attention that can differentiate between groups (Vitaliano et al., 1984). However Klein, Roca, McArthur, Vogelsang, Klein, Kirby and Folstein (1985) warn against giving undue weight to particular items on mental status exams. These investigators concluded that orientation items may not be sensitive indicators because 25% of demented patients are fully oriented to person, place, and time. By combining items to establish an overall rating, one can achieve a high degree of reliability, yet still retain adequate sensitivity and specificity. The MMS has also been found to discriminate well among demented elderly, depressed elderly with cognitive impairment, and depressed elderly without cognitive difficulties. Scores for the MMS are lowest in the demented as well as the depressed with

cognitive deficits, and highest in the depressed without cognitive impairment (Folstein & McHugh, 1978).

Despite the evidence that the deficits of demented individuals are generally more severe than those of depressed people, some authors believe that there is no convincing evidence for qualitative cognitive differences that can differentiate these groups (Jorm, 1986). Jorm (1986) believes some studies using mental status exams are confounded because they compare depressed patients with mild to moderate cognitive impairments with demented patients who likely have much more severe impairments. He suggests that the best way to examine qualitative differences would be to compare mildly impaired demented people with depressed patients (who are also typically mildly impaired). In this way the level of impairment would be controlled for, and the qualitative aspects of their deficits could be detected more easily.

Other researchers have noted that for a mental status exam to be an effective measure of cognitive ability it should be more than a test of whether there has been a loss of knowledge which shows up as confusion regarding orientation and language. Specifically, Cohen and Dunner state that "primary neuronal degeneration affects the way an individual thinks and acts, and a test of the presence and/or extent of a dementing process should be a test of how well the individual can handle information across the

cognitive domain (1980, p.129)." Tests that are neuropsychologically based may be what is needed to add to the effectiveness of current mental status measures. McLean (1987) states that these kinds of tests may be more reliable ways of assessing dementia in the elderly because they use sophisticated techniques for statistical analysis and item selection.

One such method has been developed by Storandt, Botwinick, Danziger, Berg, and Hughes (1984). This brief battery for senile dementia of the Alzheimer's type (SDAT) uses four tests including the logical memory test and mental control tests from the Wechsler Memory Scale, Form A of the Trailmaking Test, and word fluency for letters S and P. In this study, it was found that the SDAT battery was able to classify 100% of their subjects into the appropriate groups (mildly demented vs. normal control). Tierney, Snow, Reid, Zorzitto, and Fisher (1987) also found that the SDAT battery was able to accurately classify demented individuals and normal controls into the correct groups, but at a somewhat lower level of accuracy (96%). It was also found, however, that this battery was unable to distinguish dementia from other disorders where cognitive impairment was prominent, and suggested that cognitive tests alone might not be enough to make this type of distinction accurately.

MEASURES OF MEMORY FUNCTION

Cohen and Dunner noted that although there are many different models of memory function, one common theme is that memory organizes material in a series of processing stages. They assert that memory testing "should evaluate the various stages in this process and thereby show how efficiently a person assembles, stores, and uses information (1980, p.130)." Memory research has become increasingly complex, and several theories about the workings of human memory have been developed (e.g., Broadbent, 1984; Charness & Bosman, 1990; Craik & Lockhart, 1972; Hasher & Zacks, 1979; Hultsch & Dixon, 1990). However, almost every theory includes implicitly or explicitly the notions of long term memory and short term memory as well as the storage and retrieval of information into and out of them. These general notions of memory seem to be prevalent in the clinical research where memory variables are used to shed light on a larger topic (such as depression or dementia) rather than add to the research on human memory processes (e.g., Cohen & Dunner, 1980; Hart, Kwentus, Taylor, & Hamer, 1987; Masur, Fuld, Blau, Thal, Levin, & Aronson, 1989; Sternberg & Jarvik, 1976). Since complex memory models are difficult to test in a clinical setting, it seems reasonable that these general memory variables are sufficient to add to the accuracy of clinical diagnosis. So by testing the effectiveness of each of these general memory components,

clinical researchers should be able to identify qualitative differences between disorders which seem to affect memory function such as dementia and depression.

Support for this notion of qualitative differences in memory impairment dependent upon disorder can be found in the literature concerning the selective reminding procedure first developed by Buschke (1973). This procedure was designed to test learning and memory in the individual. The subject is asked to recall a list of words read aloud to him/her. After the first recall attempt the subject is reminded only of those words which were forgotten. The subject is then asked to recall the entire list again (reminded and unreminded words). This continues until the subject recalls the entire list twice consecutively or until all test trials have been completed. It has been shown to be one of the most sensitive measures in discriminating between early dementia and the normal elderly because it measures different components of general memory functioning (Masur, et al., 1989). Specifically, measures of short term recall (STR), long term storage (LTS), retrieval from long term storage (LTR), and consistent long term retrieval (CLTR) are obtained from the Selective Reminding Test (SRT: Buschke & Fuld, 1974). STR is determined by the number of words each trial which have been recalled only after reminding each time. LTS is defined as the number of words recalled spontaneously without further reminding after

initial recall. A word is considered to be in LTS even if it is forgotten after this criterion is met (this case is seen as a retrieval failure as opposed to a storage failure). Thus all subsequent recalls of words meeting the LTS criterion are defined as LTR. CLTR is defined as the number of words that are consistently recalled from LTS on at least the last three trials of the test without further reminding. A sum of recall score is also computed by adding the STR and LTR scores on each trial. A more detailed explanation of the Selective Reminding Test can be found elsewhere (SRT: Buschke, 1973; Buschke & Fuld, 1974).

Masur, et al. (1989) found that subjects in the early stages of dementia scored significantly worse on every component of the SRT than normal subjects. The scores for sum of recall (STR plus LTR), long term retrieval (LTR), and consistent long term retrieval (CLTR) seemed to be the best at predicting whether a subject was in the demented group or the normal group and thus can be seen as having the lowest risk of misclassification of the demented elderly. The authors went on to suggest that it is long term memory which is most impaired by dementia, and may be the important distinguishing memory characteristic among demented and normal elderly subjects. Not only were LTR and CLTR found to be predictive, but it was also noted in their analyses that STR alone had no significant predictive value. Thus

the significance of the sum of recall score was attributed
to the influence of the LTR component.

In another study, the SRT was found also to be
sensitive enough to distinguish between demented and
depressed persons. Hart, Kwentus, Hamer, and Taylor (1987)
reported that patients with mild dementia recalled a much
lower proportion of unreminded words from one trial to the
next than did depressed patients or control subjects. They
found that all of the measures obtained from the SRT
distinguished between depressed and demented patients, but
that the measure for long-term retrieval (LTR) seemed to be
the most significant in this study. They found that the
depressed patients did better overall than the demented
patients, but not as well as the control subjects.

The SRT has also provided evidence that difficulties
with memory, especially long term memory, may begin as much
as 2 years before any social or cognitive change warrants a
diagnosis of dementia, and has been cited as very useful as
a marker for the early stages of dementia (Masur, Fuld,
Blau, Crystal, & Aronson, 1990; Smith, et al., 1991). In a
longitudinal study, Masur, et al. (1990) found that the SRT
can be used to determine whether patients may be in a
"preclinical phase" of dementia. They found that the sum of
recall score was one of the best at contributing to the
accuracy of prospective detection of dementia. They
contended that the long term memory processes, both LTS and

LTR, are likely more sensitive to disruption than the STR process in the demented. This is supported by an earlier finding that higher sum of recall scores achieved by demented patients actually indicate failure to put items into long term memory (Masur, et al., 1989).

MEASURES OF PSYCHOLOGICAL SYMPTOMS AND BEHAVIOR

There are a variety of ways in which psychological symptoms and behavior are evaluated in studies of dementia and depression. One of the more general arguments among these studies seems to be the appropriateness of objective vs. subjective ratings for these populations. Miller (1980) reported that examiner ratings of normal, depressed, and demented elderly patients showed significantly different levels of depression among groups; but when subjective ratings of depression were used, no significant differences among groups were found. For the most part however, it appears that when both objective and subjective ratings are used in a study, the two seem to correlate well (i.e., r=.49) for mildly demented groups (Gottlieb et al., 1988; Knesevich et al., 1983). Another study noted that although mildly demented patients may "lack insight into many aspects of their disease," they still seem to be able to describe their feeling state (Shuttleworth et al., 1987; p. 735). It is likely that elderly who are in the beginning stages of dementia are very much aware of their progressive deficits and the effects these have on their moods.

Not enough work has been done to determine whether a
constellation of psychological/behavioral symptoms can be
defined as qualitatively different for demented elderly vs.
depressed elderly (Miller, 1980). However, there do appear
to be self-report scales that might be able to help
differentiate these groups in this way. One of these is the
Brief Symptom Inventory (BSI: Derogatis & Melisaratos,
1983). The BSI is a 53 item self report inventory which is
designed to assess the psychological sypmtoms of an
individual. It is an abbreviated version of the Symptom
Checklist-90 (SCL-90: Derogatis, 1977). There are three
global indices of distress unique to the BSI: (1) positive
symptom total (PST) is a count of the symptoms reported
regardless of perceived intensity, (2) positive symptom
distress index (PSDI) yields information about the perceived
intensity of symptoms corrected for symptom total, and (3)
general severity index (GSI) combines information on the
numbers of symptoms and intensity of perceived distress
making it the best single indicator of current distress
levels. In addition to these global indices, through factor
analysis of the 53 items, nine symptom dimensions have been
defined: somatization, obsessive-compulsive, interpersonal
sensitivity, depression, anxiety, hostility, phobic anxiety,
paranoid ideation, and psychoticism. Forty-nine of the 53
items load exclusively on these constructs. The remaining
four items do not load on any particular dimension, but have

been left because of they give important vegetative
information. These nine dimensions yield a profile of the
pattern of an individual's behavioral and psychological
symptomatology.

The BSI has been found to have a high degree of
accuracy in classifying rheumatoid arthritis patients into
their appropriate subgroups (Vollhardt, Ackerman, Grayzel, &
Barland, 1982). The BSI has also been found to have
discriminatory capabilities for levels of drug abuse in
clients of a treatment center, and for distinguishing
anorgasmic women into their appropriate subtypes (Royse &
Drude, 1984; Derogatis, Schmidt, Fagan, and Wise, 1989). If
the BSI can effectively distinguish such varied groups as
these, it is possible that it would be an effective
discriminator for demented and depressed ("pseudodemented")
elderly. Also, unlike some other self-report inventories,
the BSI has norms specifically for the elderly population
(Hale, Cochran, & Hedgepeth, 1984).

In conclusion, it is clear that there has been a great
deal of work done in the past ten to fifteen years in the
field of dementia and depression in the elderly. However,
it also clear that there are aspects which have received
much less attention, but which have the potential to add
much to the current pool of knowledge. An important issue
which deserves more attention is the study of possible
psychological/behavioral concommitants to dementia and

"pseudodementia" as a means of differentially diagnosing between these conditions.

The present study plans to compare three groups of able elderly (i.e., those who are living independently in the community): (1) individuals who appear to be in the early stages of a dementing process without significant depression, (2) individuals who appear to be mildly depressed without significant evidence of dementia, and (3) normal controls. These three groups will be compared on the basis of memory function, perceived memory/cognitive function, and psychological/behavioral functioning. It is expected that examination of the pattern(s) of psychological/behavioral symptoms for dementia and depression will significantly add to the accuracy of differential diagnosis of these disorders.

HYPOTHESES

1. The mildly demented elderly and the normal control elderly will have significantly fewer memory complaints than the mildly depressed elderly. A one way analysis of covariance will be used to assess any differences among these groups. Age and education will be used as the covariates.

2. The mildly depressed elderly will report significantly higher levels of global psychological/behavioral symptomatology than will the mildly demented elderly and the normal controls. A one way analysis of covariance will be performed to determine any differences using age and education as covariates against the three groups. It is expected that the mildly depressed elderly will differ more from the mildly demented and the normal control in terms of the intensity of perceived distress than in terms of the total number of symptoms reported or the current level of distress. An eta squared will be calculated for these 3 variables to analyze the effect sizes of the F ratios.

3. The pattern of psychological/behavioral symptom report will also be significantly different between the mildly depressed and mildly demented groups. It is expected that the mildly depressed will score significantly higher than the mildly demented and normal controls on

the dimensions of depression, somatization,
interpersonal sensitivity, and anxiety while the mildly
demented will score significantly higher than the
mildly depressed and normal controls on the dimension
of obsessive-compulsive and hostility. A one way
analysis of covariance will be calculated using age and
education as covariates against the three groups.

4. On actual memory functioning, here again there will be
    significant differences between the control, demented,
    and depressed groups. It is expected that the mildly
    demented will do poorer on all measures of memory than
    the control group and the mildly depressed group. The
    depressed group will do significantly poorer than the
    control group on the short term memory measures. A one
    way analysis of covariance will be calculated to
    examine any differences using age and education as
    covariates against the three groups. Moreover, the
    mildly demented group and the mildy depressed group
    will differ more on total recall and long term memory
    measures than on short term memory measures. An eta
    squared will be calculated to determine the effect
    sizes of the F ratios.

5. While information about perceived memory function,
    memory function, and psychological/behavioral symptoms
    will be able to discriminate fairly well between the
    groups, it is expected that memory function and

psychological/behavioral symptoms will be the best
predictors of group status. A discriminant analysis
will be performed using group membership as the
criterion variable and the measures perceived memory
function, memory function, and psychological/behavioral
symptoms as predictor variables.

METHODS

Subjects

Data was obtained from subjects participating in the Coping with Aging project (CWA) which is an ongoing research effort being conducted through the Michigan State University Psychological Clinic under the direction of Dr. Norman Abeles. The CWA project focuses on the current mood and memory functioning of the able elderly in the Lansing metropolitan area. By participating in the project, participants are given opportunities for receiving free feedback on their current functioning as well as taking part in mood and memory workshops with other older individuals. Subjects are recruited for this project through newspaper advertisements, site visit presentations at senior citizen independent housing, and posted flyers. Flyers were placed at grocery stores, churches, community centers, and at locations on Michigan State's campus.

In this study, data from 146 subjects were used for analysis. Participants ranged in age from 51 to 92 years. The mean age was found to be 70.34 years old. There were 113 females and 33 males. With respect to religious preferences, the majority of the sample was Protestant, 102 subjects (69.9%). The rest of the sample broke down as follows: Catholic, 24 subjects (16.4%), Jewish, 1 subject (0.7%), other, 6 subjects (4.1%), and none, 13 subjects (8.9%). The mildly demented group consisted of 52 subjects,

the mildly depressed group 24 subjects, and the normal

control group 70 subjects.

Measures

MULTILEVEL ASSESSMENT INSTRUMENT (MAI)

(Lawton, M.P., Moss, M., Fulcomer, M., Kleban, M.H., 1982)

The MAI is an assessment instrument capable of

measuring the well-being of the aged in the areas of

behavioral competence, psychological well-being, and

perceived environmental quality. For the purposes of this

study, only the section regarding memory complaints was

utilized.

HAMILTON RATING SCALE FOR DEPRESSION (HRS-D)

(Hamilton, 1960)

This interviewer-rated depression scale has been widely

used for years, and has been demonstrated to have good

internal consistency (.84) and interrater reliability (.85)

(Hamilton, 1960; Lyons, et al., 1989). Because the HRS-D

has a relatively high number of somatic items, there could

be concern in its utility in screening for depression among

the elderly. However, Yesavage, et al. reported that the

somatic items "generally correlated less strongly..." with

the total score "..than the items measuring loss of

interests, depressed mood and anxiety" (1983, p. 48). It

might be that in a relatively healthy elderly population

somatic items will not overpower the results of a depression

screening measure. A score of 11 or greater on the HRS-D is

seen as evidence of depression (Yesavage, Brink, Rose, Lum, Huang, Adey, & Leirer, 1983).

GERIATRIC DEPRESSION SCALE (GDS)

(Yesavage, et al., 1983)

This 30 item self-report depression scale was designed specifically for use with the elderly. It has been found that the GDS correlates well with interviewer-rated measures of depression (e.g., the HRS-D: $r=.83$) as well as with the Research Diagnostic Criteria for depression, $r=.82$ (Yesavage, et al., 1983). In this study, it was found to correlate fairly well with the HRS-D ($r=.68$, $p \leq .01$). Internal consistency as measured by coefficient alpha has been found to range from .88 to .93 (Lyons, Strain, Hammer, Ackerman, & Fulop, 1989). A score of 11 or greater on the GDS is considered to be indicative of depression (Yesavage, et al., 1983).

BRIEF SYMPTOM INVENTORY (BSI)

(Derogatis & Melisaratos, 1983)

This self report inventory is a 53-item abbreviated version of the SCL-90 (Derogatis, 1977). It is comprised of nine dimensions of symptomatology and three global distress indices. The nine dimensions are somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. Norms for the elderly obtained from Hale, et al. (1984) will be used as the baseline on these dimensions.

The nine dimensions have been found to have internal consistency ranging from .71 (psychoticism) to .85 (depression). The global indices of distress on the BSI (general severity index:GSI, positive symptom distress index:PSDI, and positive symptom total:PST) were also used. The GSI is calculated by summing the scores and dividing by 53. The PST is calculated by summing the number of items which were endorsed. The PSDI is calculated by dividing the sum of the 53 items by the PST. The normal controls are expected to score from 0 to .61 on the GSI, from .88 to 1.70 on the PSDI and from 2.16 to 20.74 on the PST. Test-retest reliability has been found to be .87 for PSDI and .90 for both GSI and PST (Derogatis & Melisaratos, 1983).

SELECTIVE REMINDING TEST (SRT)

(Buschke, 1973)

The SRT is a measure of verbal learning and memory processing. It consists of a list of 12 unrelated words which the subject is asked to recall. After each trial, the subject is reminded only of the words which were forgotten, and is asked to then repeat the entire list if possible. The test is completed when the subject recalls the list twice consecutively or when six trials have been attempted. The SRT has been shown to be an effective measure of a variety of memory functions including total recall, cumulative long term storage (CLTS), storage estimate, long term retrieval (LTR), consistent long term retrieval (CLTR),

consistent retrieval (CR) and retrieval from short-term storage (STR), and has been used to distinguish between persons with and without dementia (Masur, et al., 1989; Masur, et al., 1990). Total recall is calculated by summing the number of words that are recalled for each trial. CLTS is the sum across trials of the number of words that have been recalled at least twice in a row (not necessarily consistently after that) without reminding. Storage estimate is the sum of the number words occurring in the last trial which have been recalled at least twice in a row previously, but not necessarily consistently. Both CLTS and storage estimate are measures of long term storage. LTR is the sum of the number of words actually recalled on each trial without reminding. CLTR occurs when a word has been recalled for at least the last three trials without interruption. The number of words that meet this criterion are totalled for each trial and then summed across trials. Consistent retrieval (CR) is a measure of the trial to trial consistency with which a subject recalls the words. It is scored by summing the number of words recalled on two consecutive trials for each trial beginning with trial 2. Short term recall (STR) is measured by the sum of the number of words that were recalled only with reminding on each trial. Test-retest reliablity for these variables has been found to range from .84 to .92 (Masur, et al., 1989). Norms for the elderly on the SRT obtained from Masur, et al.

(1989) will be used as baselines for these memory variables. SENILE DEMENTIA ALZHEIMER'S TYPE BATTERY (SDAT BATTERY) (Storandt et al., 1984)

This is a brief battery of four psychological tests used to assess memory and cognitive functioning. Although it does not have an official name, it will be referred to in this study as the SDAT Battery. It consists of the logical memory and mental control sections of the Wechsler Memory Scale (Wechsler, 1945), Form A of Trailmaking, and word fluency for the letters s and p. Discriminant analyses were performed to obtain unstandardized coefficients for each of these tests to be used in a canonical function. These coefficients are -0.445 for logical memory, -0.066 for Trailmaking, -0.036 for word fluency, and +0.130 for mental control. A constant of +3.588 is used in the computation of the canonical score. Multiplying a person's raw score by the coefficient for each test, and then adding the products with the constant will result in a canonical score. Persons with canonical scores of 0 or greater are considered to be experiencing a dementing process. This measure has been found to accurately classify normal controls and persons with dementia at a rate of 96%.

Procedures

Each person who volunteered to participate in the research was assigned to an advanced graduate student for testing. Testing was conducted either at the MSU

Psychological Clinic or in the individual's home, whichever was preferred by the participant. The test battery took approximately 1 1/2 hours to administer, and included a structured interview, memory assessment and mental health assessment questionnaires. The participants were also asked to sign a general consent form which informed them of their right to withdraw from the project at any time.

Each person also received feedback on the results of his/her testing either by phone or in person. Feedback was focused on the individual's memory function. However, if clinical levels of depression were found, this was communicated and appropriate referrals were made. If significant memory problems were found, a similar procedure was followed. All subjects, regardless of testing results, were given the opportunity to participate in a seven session workshop which focused on improving current memory and mood status and/or preventing future difficulties. These workshops were led by two advanced graduate students, and are typically composed of six to eight research participants. Participation in the workshops was also purely voluntary. All subjects in the Coping With Aging Project are tested three times at approximately 2 month intervals. The first testing always occurs prior to any participation in a workshop. The current study uses data strictly from this first testing, but not all subjects went on to join a workshop.

In this study, subjects were assigned to one of the three groups under study based on two criteria: evidence of dementia (SDAT Battery score) and evidence of depression (Geriatric Depression Scale score and Hamilton Rating Scale for Depression score). Subjects assigned to the mildly demented group had to obtain a canonical score 0 or greater on the SDAT Battery. Subjects assigned to the mildly depressed group had to obtain a canonical score of less than 0 on the SDAT Battery and score 11 or greater on either the GDS or the Hamilton scales for depression. Because the literature is equivocal as to the the value of self-report vs. objective reporting for depression, it was decided to include a subject in the depressed group if a clinically significant score was obtained on either measure. Seventeen subjects obtained clinically significant scores on both the dementia and the depression measures, but this was too small a sample to form a fourth group (i.e., demented and depressed). These participants were placed in the mildly demented group since the literature has suggested that poor overall performance on objective testing of cognitive function, such as the SDAT Battery, is more indicative of a dementing process rather than primary depression (e.g., Miller, 1980). Subjects who obtained a canonical score of less than 0 and scored 10 or less on both depression measures were assigned to the normal control group.

RESULTS

Hypothesis #1 stated that the mildly demented elderly and the normal control elderly would have significantly fewer memory complaints than the mildly depressed elderly. Performance of a oneway analysis of variance (ANOVA) and follow-up t-tests gave partial support to this hypothesis. It was found through the ANOVA that there were significant main effects based on group status for this variable. However, t-tests showed no significant difference between the mildly demented group and the mildly depressed group (see Appendix A: Table 1 for t-test data) and no difference between the mildly demented and the control groups. The depressed group was found to have significantly more memory complaints than the control group, however. A cut-off level of .01 was used in all t-tests to guard against the effects of statistical artifacts. There were no significant effects in the ANOVA for either of the covariates, age and education.

Hypothesis #2 stated that the depressed participants would report significantly higher intensity on global symptoms than would either the demented or control groups as measured by the Brief Symptom Inventory. Specifically, it was expected that the depressed group would differ from the demented and control groups more in terms of intensity of perceived distress (PSDI) pattern than in terms of total number of symptoms (PST) or general level of current

distress (GSI). This hypothesis, however, was not supported. Significant main effects for group were found in the ANOVA for all three global indices (see Appendix A: Table 2). However, no significant differences were found between the mildly demented and the mildly depressed groups on the pure intensity measure (see Appendix A: Table 3 for means and standard deviations, and Appendix A: Table 4 for t-test data). Significant differences between these two groups were found though for the other two global indices with the depressed group scoring significantly higher than the demented group on each index. Significant differences were also found between the depressed and the control groups for all three global indices. Significant differences were found, though not hypothesized, between the demented and the control groups on only the PSDI. In addition, on all three variables there was a significant effect for education (see Appendix A: Table 5). Education was found to be negatively correlated to these three global indices of distress (see Appendix A: Table 5). There was no significant effect found for age on any of these variables. An eta^2 was also calculated to determine which variable appeared to explain the greatest amount of variance. The following effect sizes were found: PSDI=.13, PST=.19, and GSI=.15.

Hypothesis #3 stated that the pattern of symptom report would also be significantly different between the mildly depressed and the mildly demented groups. It was expected

that the depressed subjects would score significantly higher
than the demented and control participants on the Brief
Symptom Inventory dimensions of depression, somatization,
interpersonal sensitivity, and anxiety while the demented
would score significantly higher than the depressed and
control on the dimensions of obsessive-compulsivity and
hostility. In the ANOVA all symptom dimensions except
hostility showed significant main effects for group status
(see Appendix A: Table 2). T-tests (see Appendix A: Table 3
for means and standard deviations and Appendix A: Table 6
for t-test data) revealed significant differences between
the mildly depressed and the mildly demented groups only on
the dimensions of depression, paranoid ideation, and
psychoticism with the depressed group scoring higher than
the demented group on each dimension. The depressed and the
control subjects were found to significantly differ on the
eight symptom dimensions and the additional items factor.
Significant differences between the demented group and the
control group were found only on the dimensions of
somatization and phobic anxiety. When compared with the
norms developed by Hale, et al. (1984), it was found that
the depressed group scored above normal limits on only two
of the dimensions, obsessive-compulsive and paranoid
ideation. The demented and control groups were within
normal limits on all dimensions. With respect to the
covariates, it was found that age was not a significant

factor for any of the symptom dimensions. Education, however, was found to have a significant effect on the dimensions of somatization, anxiety, and paranoid ideation (see Appendix A: Table 5). A significant negative correlation was found between education and somatization, and education and anxiety. A negative correlation was also found to exist between education and paranoid ideation, but this did not reach significance (see Appendix A: Table 5).

Hypothesis #4 stated that there would be significant differences between the three groups on actual memory functioning as measured by the Selective Reminding Test. It was expected that the mildly demented group would do poorer on all measures of memory than the mildly depressed and the control groups. This was largely supported with one exception (short term memory). Significant main effects for group were found in the ANOVA for all measures of memory except short term recall (see Appendix A: Table 7). T-tests revealed that the demented participants did indeed perform significantly worse than the other groups on all memory measures that showed main effects (see Appendix A: Table 9 for t-test data). It was also expected that the depressed group would do significantly poorer than the control group with respect to the short term memory measure. However, there were no significant differences found between the depressed and the control groups on any of the measures of memory. In addition, it was expected that the demented and

the depressed groups would differ most on the total recall
and the long term memory measures rather than on the short
term memory measure. This was certainly found to be true
since short term recall was not found to differentiate
significantly between any of the groups. Eta^2 was
calculated for each of the measures to analyze the
significance of the effect sizes. Total recall was found to
have the largest effect size (eta2=.31), and short term
recall the smallest (eta^2=.05). The rest were as follows:
long term retrieval (LTR) - eta^2=.28, storage estimate -
eta^2=.29, cumulative long term storage (CLTS) - eta^2=.26,
consistent long term retrieval (CLTR) - eta^2=.27, and
consistent retrieval (CR) - eta^2=.28. It was also found
that both covariates, age and education, had significant
effects on all memory measures except for short term recall
where only age was significant (see Appendix A: Table 10).
Age was found to be negatively correlated to total recall,
LTR, storage estimate, CLTS, CLTR, and CR. Age was
significantly positively correlated with short term recall.
Education was found to be positively correlated to total
recall, storage estimate, CLTS, CLTR, and CR (see Appendix
A: Table 10).

Hypothesis #5 stated that while information about
perceived memory function, actual memory function and
reported symptomatology would discriminate between groups,
it was expected that memory function and

psychological/behavioral symptoms would be the best
predictors of group status. This hypothesis was supported.
Discriminant function analyses were performed using the nine
symptom dimensions, six of the seven memory measures, and
the perceived memory function variable in one analysis, and
the three global symptom indices in another analysis. The
short term recall measure was left out of the equation
entirely for two reasons. The first was because it did not
produce significant main effects for group. The second
reason is that it is derived by subtracting the long term
retrieval score from the total recall score. Including an
item that is linearly related to other items would make
interpreting its contribution to a discriminant function
analysis impossible. It is for this same reason that the
three global indices were placed in a separate analysis -
they are all linearly related to the nine symptom dimensions
so could not be included in the same analysis.

The results of analysis #1 revealed two functions were
needed to account for the variance in group membership. The
first function in analysis #1 contrasted the mildly demented
and the depressed groups with the control group as indicated
by the group centroids: -1.09, -0.41, and 0.83 respectively.
The second function in analysis #1 contrasted the depressed
group with the demented and control groups as indicated by
the group centroids: 1.79, -0.53, and -0.19 respectively.
It was found that the memory measures were significantly

better predictors of group status for the mildly demented

subjects as seen on function #1 (see Appendix A: Table 11).

Hostility was found to be a significant predictor of

demented status, but it cannot be interpreted with any

confidence since it was not shown to have significant main

effects for group in the ANOVA. Interpersonal sensitivity

was found to have significant main effects for group, and

was found to be a significant predictor of demented status.

However, it was the least correlated of all the predictors.

In addition, examination of the cross-loadings between the

functions suggests that these two BSI dimensions were much

less cleanly loaded on either function than were the memory

indices. It is likely that these two dimensions loaded onto

function #1 as a result of a collinearity problem within the

BSI. Hostility and interpersonal sensitivity were also the

only predictors found to be negatively correlated. Again,

it must be noted that both the demented and the depressed

groups were within normal limits on these two dimensions.

With respect to function #2, it was found that the remaining

seven symptom dimensions, the BSI additional items plus

memory complaints were significant predictors of group

status for the mildly depressed subjects (see Appendix A:

Table 11). All predictors were positively correlated.

Examination of the cross-loadings of the BSI dimensions

within this function revealed that depression, anxiety,

psychoticism, and the additional items loaded the most

cleanly and were therefore the best of these predictors.
Memory complaints was not found to load cleanly on either
function and was fairly weak as a predictor on function #2.
This lends support to the hypothesis.

The results of analysis #2 found that among the global
indices on the Brief Symptom Inventory (BSI) again two
functions were needed to account for the variance in group
status. The first function contrasted the depressed group
with the demented and the control groups as indicated by the
group centroids: 1.14, 0.29, and -0.53 respectively. The
second function contrasted the demented group with the
depressed and the control groups as indicated by the group
centroids: 0.23, -0.24, and -0.08 respectively. It was
found that within function #1 the positive symptom total
(PST) and the general severity index (GSI) were significant
predictors of depressed status, and within function #2 the
pure symptom distress index (PSDI) was a significant
predictor of demented status (see Appendix A: Table 12).
Again, all predictors were positively correlated. Of the
three variables, the PST and the GSI loaded more cleanly on
their function than did the PSDI on its function.

It was also found that, of the two analyses, the groups
were most accurately classified overall when symptom
dimensions, memory scores, and memory complaints were taken
together (analysis #1) as predictors as opposed to simply
using the BSI global indices (see Appendix A: Table 13).

For both analyses, the probability that members would be placed in their correct group by chance was calculated at 39%. With respect to classification for the individual groups, it was found that there was not much difference for either the depressed or control groups between the analyses. However, the demented group was accurately classified at a much higher rate in analysis #1 than in analysis #2 (70% vs. 29%).

There is one issue which must be mentioned with respect to the discriminant function analysis. In examining the standardized canonical discriminant function coefficients, it was found that three of the Selective Reminding Test (SRT) memory scores (long term retrieval, cumulative long term storage, and consistent retrieval) had coefficients well above 1.00, and one of the BSI global indices, PSDI, had a coefficient just slightly over 1.00 (see Table 14). The PSDI's is very close to 1.00 and is due to its being mathematically derived using one of the other indices. Therefore the coefficient is a statistical artifact and does not pose any real interpretive problem. However, there is some concern regarding the psychometric properties of the SRT. These scores are not mathematically derived from each other or from the other SRT indices but are instead various manipulations of the same data set. It cannot be said that they are linearly related, and that the collinearity is therefore a statistical artifact. The collinearity is a

problem that appears to be inherent in this instrument making interpretation of these particular indices difficult. However, these indices are all intended to be measures of long term memory and do follow the same pattern within the discriminant analysis so it would seem that some general conclusions along these lines could be discussed even though individual interpretation of these indices might be inappropriate.

Although not hypothesized, some interesting results were found with respect to the characteristics of the groups. The groups were found to be significantly different from each other based on the selection criteria (see Appendix A: Table 15). However, it was found that the means for the depressed group on the Geriatric Depression Scale and the Hamilton Rating Scale for Depression were just barely clinically significant (see Appendix A: Table 15). T-tests on the covariates revealed that the demented group was significantly older than either of the other two groups, but no difference in age was found between the depressed and control groups (see Appendix A: Table 16). The modal age for the entire sample was sixty-five. With respect to education, it was found that the depressed and the control groups had significantly higher levels of schooling than did the demented group (see Appendix A: Table 16). The depressed and control participants did not differ from each other on this variable (using $p \leq .01$ as the cut-off). In

addition, in order to determine whether there was an
equivalent level of severity between the demented and the
depressed groups, z-scores were computed for the group means
of the four SDAT Battery subtests (the mean of these z-
scores being used for comparison) within the demented group.
Z-scores were then computed for the group means of the
Geriatric Depression Scale and the Hamilton Rating Scale for
Depression (again using the mean of these two z-scores)
within the depressed group. It was found that both groups
fell within the mildly dysfunctional range; that is, the
demented were mildly demented and the depressed mildly
depressed (z=1.20 and z=1.60 respectively).

Again, although not hypothesized, it was found that
there were some interesting correlations within and between
the variables. Using $p \leq .01$ as the cut-off level, it was
found that the symptom dimensions on the Brief Symptom
Inventory are all highly correlated with each other ranging
from r=.25 to r=.73 (see Appendix A: Table 17). The indices
on the Selective Reminding Test were found also to be highly
correlated (see Appendix A: Table 18). Leaving out the
short term recall score, the correlations for the long term
memory indices ranged from r=.87 to r=.99. The short term
recall score correlated at r=-.42 to r=-.70. There were
significant positive correlations for memory complaints with
the BSI dimensions of obsessive-compulsivity, depression,
anxiety, hostility, phobic anxiety, psychoticism, and the

additional items as well as with the SRT index for short term recall. It was found that memory complaints was negatively correlated with all of the rest of the SRT indices (see Appendix A: Table 19).

DISCUSSION

The purpose of this research was to determine whether any specific qualitative differences might exist between three groups of able elderly: mildly demented, mildly depressed, or normal control (no signs of either dementia or depression). Participation in the research was purely voluntary and self-selecting. Anyone who was 55 years or so of age or older and lived independently in the community was eligible. Subjects were compared based on perceived memory functioning, actual memory functioning, and reported psychological/behavioral functioning.

Perceived Memory Functioning

In this study, mildly demented participants were not different from either the mildly depressed or the control subjects with respect to number of memory complaints. It was expected that the mildly depressed would have significantly higher numbers of complaints than the demented, but this was not the case. The mildly depressed did complain much more often about their memory funtions than did the control subjects which was expected. While other studies have noted that memory deficits appear to be particularly accentuated by elderly depressed individuals (e.g., Gershon & Herman, 1982; Esser & Vitaliano, 1988; Fopma-Loy, 1986), this study only found this to be true when compared to normal controls but not with the mildly demented. These findings seem to be in line with Miller's

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(1980) finding that "aged individuals with clinical depression complained about memory as much as those with altered brain function..." A possible explanation for the current findings, however, is that the depressed in this sample suffered from only mild dysfunction. Other studies have used clinical populations, rather than community samples, where the mean scores on the Hamilton Rating Scale for Depression have been reported at 16.6 for the mildly depressed compared to 11.46 for this sample (Miller, 1980). It should be noted that scores on the Hamilton may have been low because this instrument was designed for use with a clinical population, and may not be the most appropriate measure of depression for a community sample. Thus, it is difficult to know whether more severe levels of depression in this group would have increased memory complaints to the point of differentiating it from the demented group. The presence of some depressed and demented subjects in the demented group might also act to cloud potential differences between the comparison groups. This is less likely though due to the lack of difference between the demented and the control groups on this variable.

The finding that the depressed have significantly higher numbers of memory complaints than the controls poses a potential problem for the recently debated "diagnostic" category of age-associated memory impairment (AAMI: Crook, et al., 1986). This category was developed to help deal

with the difficulties involved in distinguishing memory changes due to early dementia from those due to normal aging. The criteria which define this category were designed to describe older people who have no evidence of neurological impairment, but have complaints about their memory function and show some changes in memory that could be functionally significant (Smith, et al., 1991). Unfortunately, the evidence here suggests that increase in memory complaints is strongly related to the presence of depression, and thus might confound AAMI as a clear diagnostic category for normal aging. Thus, it might be wise for practitioners to not only look for evidence of neurological damage in older individuals, but also for depression, before assigning AAMI as a diagnosis.

Reported Psychological/Behavioral Functioning

The psychological/behavioral functioning of the three groups was examined on two levels: global and symptom-specific. At the global level, distress was measured by number of symptoms, intensity of symptoms, and a general severity index which combined both. It was found that mildly depressed participants obtained higher scores than the mildly demented on only two of the indices (number of symptoms and general severity) while obtaining higher scores than the controls on all three. The mildly depressed and the mildly demented did not differ based on intensity of symptoms. This could have occurred because both groups were

of equal severity (both in the mild range according to previously reported z-scores). In addition, intensity of symptoms was the only index that differentiated the demented from the controls. Thus this index was the only one which could distinguish the two "dysfunctional" groups from the normal control group. One would expect based on the selection criteria that the depressed group would score significantly higher on global psychological/behavioral symptomatology than the other groups, but the intensity index did not consistently follow the same trend as the other two global indices. This could make the intensity index on the Brief Symptom Inventory a useful method in future studies for selecting groups based on severity of dysfunction (e.g., if studying mild, moderate, and severe depression in the elderly).

Another interesting finding related to the global indices of symptomatology was the distribution of effect sizes. It appeared that the number of symptoms had the largest effect size of the three in that it seems to account for a larger amount of the variance than the others do. The intensity index appeared to have the smallest effect size according to the bivariate results which is striking since it seemed to be the most powerful with respect to differentiating among the three groups in the discriminant analysis.

At the symptom-specific level, it was found that the

depressed scored significantly higher than the controls on all dimensions which showed significant main effects for group. This of course is not surprising due to the selection criteria. The depressed reported significantly higher symptoms than the demented on only three dimensions: depression, paranoid ideation, and psychoticism. Upon closer examination of each factor's items, it was noted that items on the psychoticism dimension could easily fit into a depressive framework (e.g., "feeling lonely even when you are with people," "the idea that you should be punished for your sins," and "never feeling close to another person"). In this study, it was found that the depression and psychoticism are the most highly correlated of all the dimensions ($r=.73$). It was not expected that the depressed would differ on psychoticism, but this makes more sense given the underlying relatedness of the items. It was also not expected that the depressed would be more highly suspicious than the demented. This is contrary to the literature which noted that paranoia, as well as obsessional symptoms, might exist as coping mechanisms in the dementing process (Rubin, et al., 1987; Merriam, et al., 1988; Janowsky, 1982). It might be that the dementia found in this sample is so mild that these symptoms have not become an issue yet. It was expected that obsessive-compulsivity and hostility would be the significant dimensions for the demented, but this was not born out by the data. In fact,

the only dimensions on which the demented score highly are somatization and phobic anxiety on which they are significantly different from the normal controls. These are the only areas of overlapping symptoms between the depressed and demented groups. One could speculate that the seeming lack of memory complaints for the demented group could be a function of an increase in somatic symptoms. Rather than acknowledge any deterioration in memory functioning, the mildly demented attribute any problems to physical difficulties or ailments. Examination of the items which comprise the phobic anxiety factor reveal an underlying theme of mistrust in one's capacity to take care of oneself (e.g., "feeling afraid to travel on buses, subways, or trains," "feeling uneasy in crowds," "feeling nervous when you are left alone"). It might be that the demented participants are becoming increasingly wary of what have likely been familiar situations; maybe because they are vaguely aware that their capacity to handle them is decreasing. Unfortunately, it is impossible to know whether this high score on phobic anxiety is a premorbid condition or not.

It should be noted that of all the symptom dimensions, hostility was the only one which did not significantly differentiate between any of the groups. It could be that this resulted from a demand characteristic inherent in the recruitment for the Coping With Aging Project. Since

subjects volunteered for this project due to their own
interests in their current mood and memory statuses, and/or
due to their wishes to participate in this research effort,
they might have believed it to be counterproductive to
display or report any hostile feelings or behavior. They
may have been concerned that doing so might curtail their
chances of being accepted into the project even though no
conditions relating to interpersonal functioning were ever
mentioned by project staff. In this context, low frequency
and intensity of reported hostility makes sense for all the
groups.

Actual Memory Functioning

Based on data from the Selective Reminding Test, it was
found that the demented group performed significantly worse
than either the depressed or the control group on all of the
memory indices except short term recall. There were no
significant performance differences among the groups on this
variable. These findings are similiar to those of Masur, et
al. (1989) who reported that subjects in the early stages of
dementia scored significantly worse on every component of
the SRT than the normal subjects. And although Masur, et
al. (1989) did find short term recall to be a significant
variable, they also found that it was the total recall score
and the long term memory indices that had the best
predictive value as to whether a subject was in the demented
group or not. It should be remembered that total recall is

calculated as the sum of long term retrieval and short term recall. Since short term recall was nonsignificant in the current study but total recall was, these findings appear to lend even greater support to the importance of long term memory indices in the diagnosis of dementia. They also lend support to Masur, et al.'s (1990) contention that it is long term memory processes which are more likely sensitive to disruption than short term in the demented. No significant differences were found between the depressed group and the control group on any of the memory indices. This finding is in contradiction to other studies which have found that though depressed subjects perform better on memory tasks than do demented individuals, they still do not perform as well as control subjects (e.g., Hart, et al., 1987). Again this could be a result of the mild form of depression that existed among this study's sample. However, the demented group was also found to be only mildly demented, and yet there seemed to be a significant impact on their memory performances. One explanation might be that depression must be of at least moderate severity before any evidence of memory impairment will be seen, while even very mild degrees of dementia are enough to interfere with memory functioning. This is supported by findings from a longitudinal study which found that difficulties with memory, especially long term memory, may begin as much as two years (the "pre-clinical phase") before any social or cognitive change might

warrant a diagnosis of dementia (Masur, et al., 1990; Smith, et al., 1991). The findings above related to the relative lack of major symptomatology for the demented group seem to bear this out as well. The effect sizes found for the long term memory indices also supports their importance. These measures were found to account for the greatest amount of the variance.

Predictive Value of the Variables

Although not surprising, it was found that overall the total recall and long term memory indices best predicted for demented group status, and that the symptom dimensions and level of memory complaints best predicted for depressed group status. Of the global indices, it was found that number of symptoms and general severity best predicted for depressed group status, and intensity for demented group status. This too was not surprising since intensity was the only distinction between demented and normal subjects. Although there were two symptom dimensions which predicted for demented group status (hostility and interpersonal sensitivity), neither one loaded cleanly on either function. The correlations were probably due to the relatedness among all the factors within Brief Symptom Inventory. Overall however, there was a fairly clean breakdown of the variables which suggests that in the very early (or mild) stages of these disorders there are clearer distinguishable differences between them than what might be found in more

advanced stages. The issue of collinearity within the Selective Reminding Test, though it does not condemn the instrument, does suggest caution in interpreting the indices much further than the concepts of short term vs. long term memory.

General Issues

On several of the analyses, age and education were used as covariates to determine their impact on the main effects for group for the dependent variables. With respect to the global indices of symptomatology, education was found to be negatively correlated with all of them. This is striking due to the fact that the depressed group was found to have significantly more education than the demented group, and yet still obtained significantly higher scores on the general severity index and the numbers of symptoms. In addition, the depressed group reported higher levels of distress on all three indices than the control, and there was no difference on education between these two groups. It would appear then that depression may override the potential "buffering" effect education might have, and suggests that perhaps even a little depression in the elderly has powerful effects. What is not clear is the extent to which this population may have underreported depression. It would be interesting to note if any other affective disorders (e.g., anxiety disorder) would display the same pattern or if depression is unique in this way. Education was also found

to be negatively correlated with the dimensions of
somatization and anxiety. This might shed some light on the
finding that the demented individuals scored significantly
higher on somatization than the control subjects. The
demented subjects were found to have significantly lower
educational levels than the control group therefore it could
be that the demented may describe and/or attribute more
complex feeling states to physical problems or ailments.
Age, on the other hand, was not found to be a significant
factor for either the global indices or the symptom
dimensions. This is contrary to reports in the literature
which cite that the risk of depression increases with age
(Gershon & Herman, 1982). There have also been special
norms developed for the Brief Symptom Inventory especially
for elderly samples because it has been noted that the
elderly tend to obtain higher scores than young adults
(Hale, et al., 1984). However, this study seemed to be
testing the young-old at best, with the modal age being
sixty-five, and therefore this group may not be much
different from the young adults studied in other reports.

With respect to memory functioning, it was found that
education was positively related to all of the memory
indices except short term recall to which it was not related
at all, and age was negatively related to all memory indices
except short term recall to which it was positively related.
This suggests that aging is related to decline in long term

memory functions, but to an increase in short term memory functions. A decrease in attention and concentration abilities as one ages might explain this decline in long term memory functioning. It appears that education may tend to counteract this however. It is possible though that these correlations may also have occurred because there were significant differences found between the demented group and the other two groups on each of the covariates with the demented group being older and less educated than the depressed and control groups.

It has been mentioned that among the demented participants in this sample some also obtained clinically significant scores for depression. However, the depression did not appear to be a major contributor considering the results of the analyses. It has been suggested if the dementia is very mild (as in this study) then depression may not become a significant factor (Salzman & Gutfreund, 1986). Reifler, et al., (1982) noted that significant depressive symptoms were typically more common in the beginning stages of the dementing process, and significantly less in the more severely impaired patients. It might be that Reifler, et al. was referring to the beginning stages of diagnosed dementia whereas in this study none of the subjects has been officially diagnosed as demented. Therefore it could be that at what Masur, et al. (1990) call the "pre-clinical" phase of dementia, depression has not become a significant

part of the clinical picture, but may develop later when the
syndrome progresses enough to warrant a diagnosis. So there
may be a "window of risk" for depression in dementia which
could give diagnosticians an idea of how far along the
disorder is. The issue of which comes first dementia or
depression has been recently discussed in the literature.
Teri and Wagner (1992) suggest that there is evidence on
both sides, and cite studies which support the notion that
later life depression may be a precursor to dementia.
However, they admit that although "the reverse argument is
less well studied", it is "no less compelling" (p.381). It
is this argument, dementia occurring prior to significant
depression, which gains support from the findings here. Of
course, without a longitudinal perspective it is very
difficult to state this more conclusively, and it must be
born in mind that one is not necessarily the precursor to
the other in all situations.

Conclusions

In summary, it would appear that in its mildest forms
dementia and depression in the elderly seem to impact on
very different aspects of individual functioning. The first
aspect affected by a dementing process appears to be long
term memory functioning. However, mild depression appears
to affect solely the psychological/behavioral functioning.
While this finding is by no means startling in the general
population, it is somewhat surprising in an elderly sample

where it has been reported in the literature that memory impairment can be used as a signal for depression (Esser & Vitaliano, 1988; Gershon & Herman, 1982; Janowsky, 1982). However, it must again be noted that the sample used in this study was restricted in range with respect to age of the participants, likely representing the young-old for the most part.

Thus it might be easier to distinguish between the disorders of dementia and depression when each is in the very early stages. It is difficult to know what the depressed in this sample might look like if their depressions became more severe. Perhaps increased memory impairment would be evident at that stage making differential diagnosis more difficult. This makes a convincing case for "preventive" assessments such as "mood and memory check-ups". Such assessments could provide able elderly with a baseline of their functioning which could then be reassessed over time. It might give health care professionals much earlier warning of impending problems, a better idea of relevant diagnoses, and a head start on effective intervention, if needed. Several avenues for future research can be suggested as a result of the findings in this study. One recommendation would be to examine the question of which comes first, dementia or depression, posed by Teri and Wagner (1992). This, of course, would require more longitudinal studies which are badly needed in this

area of research. Another avenue might be to examine the use of the intensity index on the Brief Symptom Inventory as a way of "scaling" the severity of depression (or other affective disorders). It is also apparent from this research that the impact of age and education needs to be taken into account in future studies and explored more carefully. One possible reason that age was not found to be much of a factor here could be a function of studying the able elderly who are more likely to be members of the young-old set. Additionally, although not included in this study, the issues of gender, health and marital status, and activity level might be useful variables to address in future studies. Gender was not explored in this study because of the overwhelming numbers of females vs. males in the sample, and the difficulty this might pose in the clear interpretation of statistical findings. Finally, again although not a focus of this study, the impact of medications might be useful to explore when examining the qualitative differences between dementia and depression. Quantifying such a variable might prove to be difficult, but with medications being such a common part of old age in this country, including it might yield some important findings.

Because there are still many questions to be answered in this field, it is important that research efforts continue. With the elderly population increasing at a rapid pace, the answers will be vital.

APPENDIX

APPENDIX

List of Tables

Table 1

T-tests of Memory Complaints

Means and Standard Deviations

Variable	MDM	MDP	NC
Memory Complaints			
Means	1.44	1.63	1.26
SDs	0.50	0.50	0.44

MDM= mildly demented group
MDP= mildly depressed group
NC= normal control group

T-Values

T-test Probability	T-Value	Degrees of Freedom	2-Tailed
Test 1	-1.49	45	$p \leq .14$
Test 2	3.19	37	$p \leq .003$
Test 3	2.07	102	$p \leq .04$

Test 1= MDM vs. MDP
Test 2= MDP vs. NC
Test 3= MDM vs. NC

Table 2

Significant Main Effects for Group on BSI Global Indices and Dimensions

Variable	F-Value	2-Tailed Probability
PSDI	7.095	$p \leq .001$
PST	15.024	$p \leq .000$
GSI	10.548	$p \leq .000$
Depression	21.955	$p \leq .000$
Somatization	9.015	$p \leq .000$
Interpersonal Sensitivity	4.020	$p \leq .02$
Anxiety	7.991	$p \leq .001$
Additional Items	8.038	$p \leq .000$
Obsessive-Compulsive	5.529	$p \leq .005$
Phobic Anxiety	9.494	$p \leq .000$
Paranoid Ideation	11.952	$p \leq .000$
Psychoticism	13.763	$p \leq .000$

Table 3

Means and Standard Deviations for T-tests of Global Indices
and
Subscales

Variable	MDM	MDP	NC
PSDI			
Means	1.61	1.72	1.34
SDs	0.49	0.44	0.35
PST			
Means	16.65	25.71	12.70
SDs	10.91	9.14	8.20
GSI			
Means	0.54	0.87	0.37
SDs	0.41	0.43	0.43
Depression			
Means	0.44	1.03	0.26
SDs	0.52	0.67	0.38
Somatization			
Means	0.54	0.77	0.22
SDs	0.57	0.73	0.33
Interpersonal Sensitivity			
Means	0.57	0.86	0.40
SDs	0.71	0.78	0.51
Anxiety			
Means	0.43	0.74	0.31
SDs	0.47	0.64	0.37
Obsessive-Compulsive			
Means	1.28	1.64	0.98
SDs	0.87	0.99	0.73
Phobic Anxiety			
Means	0.27	0.49	0.11
SDs	0.37	0.65	0.18
Paranoid Ideation			
Means	0.43	0.87	0.29
SDs	0.53	0.54	0.38
Psychoticism			
Means	0.34	0.73	0.22
SDs	0.41	0.61	0.29
Additional Items			
Means	0.38	0.70	0.29
SDs	0.49	0.54	0.32

Table 4

T-Tests for BSI Global Indices

Variable Probability	T-Value	Degrees of Freedom	2-Tailed
PSDI: Test 1	-0.98	50	$p \leq .33$
Test 2	3.87	33	$p \leq .000$
Test 3	3.39	85	$p \leq .001$
PST: Test 1	-3.77	53	$p \leq .000$
Test 2	6.17	37	$p \leq .000$
Test 3	2.19	91	$p \leq .03$
GSI: Test 1	-3.09	43	$p \leq .003$
Test 2	4.90	40	$p \leq .000$
Test 3	2.28	113	$p \leq .03$

Test 1= Demented vs. Depressed
Test 2= Depressed vs. Normal Control
Test 3= Demented vs. Normal Control

Table 5

Main Effects and Correlations for Education on BSI Global
Indices and Dimensions

Variable	F-Value	Correlation (r)
PSDI	2.066 (p≤.001)	-.26 (p≤.01)
PST	7.895 (p≤.006)	-.21 (p≤.05)
GSI	7.362 (p≤.008)	-.21 (p≤.05)
Somatization	17.545 (p≤.000)	-.31 (p≤.01)
Anxiety	5.724 (p≤.02)	-.20 (p≤.05)
Paranoid Ideation	5.455 (p≤.02)	-.16 (p≤.05)

NS= Not Significant

Table 6

T-Tests for BSI Dimensions

Variable	T-Value	Degrees of Freedom	2-Tailed Probability
Depression			
Test 1	-3.83	37	p≤.000
Test 2	5.35	28	p≤.000
Test 3	2.09	89	p≤.04
Somatization			
Test 1	-1.34	37	p≤.19
Test 2	3.58	26	p≤.001
Test 3	3.67	76	p≤.000
Interpersonal Sensitivity			
Test 1	-1.56	41	p≤.13
Test 2	2.72	30	p≤.01
Test 3	1.48	88	p≤.14
Anxiety			
Test 1	-2.13	35	p≤.04
Test 2	3.13	28	p≤.004
Test 3	1.54	93	p≤.13
Additional Items			
Test 1	-2.47	41	p≤.02
Test 2	3.50	29	p≤.002
Test 3	1.13	82	p≤.26
Obsessive-Compulsive			
Test 1	-1.54	40	p≤.13
Test 2	2.99	32	p≤.005
Test 3	2.00	99	p≤.05
Phobic Anxiety			
Test 1	-1.58	30	p≤.12
Test 2	2.83	24	p≤.009
Test 3	2.80	68	p≤.007
Paranoid Ideation			
Test 1	-3.34	44	p≤.002
Test 2	4.83	31	p≤.000
Test 3	1.54	88	p≤.13
Psychoticism			
Test 1	-2.88	33	p≤.007
Test 2	4.00	27	p≤.000
Test 3	1.86	88	p≤.07

Test 1= Demented vs. Depressed
Test 2= Depressed vs. Normal Control
Test 3= Demented vs. Normal Control

Table 7

<u>Significant Main Effects for Group on SRT Scores</u>

<u>Variable</u>	<u>F-Value</u>	2-Tailed <u>Probability</u>
Total Recall	11.100	$p \leq .000$
LTR	10.015	$p \leq .000$
Storage Estimate	10.468	$p \leq .000$
CLTS	9.190	$p \leq .000$
CLTR	8.942	$p \leq .000$
CR	9.696	$p \leq .000$

Table 8

Means and Standard Deviations for Memory Scores

Variable	MDM	MDP	NC
Total Recall			
Means	24.68	38.17	41.02
SDs	10.97	11.35	11.33
Long Term Retrieval			
Means	9.00	24.28	28.63
SDs	10.85	15.79	15.90
Storage Estimate			
Means	2.85	6.28	7.35
SDs	2.91	3.66	3.36
CLTS			
Means	11.00	26.50	30.68
SDs	12.32	16.62	16.27
CLTR			
Means	3.73	17.00	19.95
SDs	8.71	12.99	14.05
Consistent Retrieval			
Means	5.45	16.56	19.67
SDs	7.61	11.67	12.33

Table 9

T-Tests for SRT Scores

Variable Probability	T-Value	Degrees of Freedom	2-Tailed
Total Recall			
Test 1	-4.23	32	p≤.000
Test 2	-0.94	28	p≤.36
Test 3	-7.25	85	p≤.000
LTR			
Test 1	-3.73	25	p≤.001
Test 2	-1.03	28	p≤.31
TEst 3	-7.41	100	p≤.000
Storage Estimate			
Test 1	-3.51	27	p≤.002
Test 2	-1.12	26	p≤.27
Test 3	-7.19	92	p≤.000
CLTS			
Test 1	-3.54	26	p≤.002
Test 2	-0.94	27	p≤.35
Test 3	-6.93	97	p≤.000
CLTR			
Test 1	-3.95	24	p≤.001
Test 2	-0.83	30	p≤.41
Test 3	-7.20	100	p≤.000
CR			
Test 1	-3.70	24	p≤.001
Test 2	-0.98	29	p≤.33
Test 3	-7.23	101	p≤.000

Test 1= Demented vs. Depressed
Test 2= Depressed vs. Normal Control
Test 3= Demented vs. Normal Control

Table 10

Significant Main Effects and Correlations for Covariates on
SRT Scores

Variables	F-Value	Correlation (r)
Education		
Total Recall	8.913 ($p \leq .003$)	+.34 ($p \leq .01$)
LTR	5.960 ($p \leq .02$)	+.30 ($p \leq .01$)
Storage Estimate	6.061 ($p \leq .02$)	+.30 ($p \leq .01$)
CLTS	4.561 ($p \leq .04$)	+.28 ($p \leq .01$)
CLTR	5.515 ($p \leq .02$)	+.30 ($p \leq .01$)
CR	5.709 ($p \leq .02$)	+.30 ($p \leq .01$)
Age		
Total Recall	49.567 ($p \leq .000$)	-.55 ($p \leq .01$)
LTR	45.102 ($p \leq .000$)	-.54 ($p \leq .01$)
STR	10.696 ($p \leq .001$)	+.30 ($p \leq .01$)
Storage Estimate	45.608 ($p \leq .000$)	-.54 ($p \leq .01$)
CLTS	42.272 ($p \leq .000$)	-.53 ($p \leq .01$)
CLTR	43.507 ($p \leq .000$)	-.53 ($p \leq .01$)
CR	47.910 ($p \leq .000$)	-.54 ($p \leq .01$)

Table 11

Discriminant Function Coefficients from Analysis #1

Variable	Function 1 (MDM)	Function 2 (MDP)
Total Recall	0.67468*	0.30702
Storage Estimate	0.65078*	0.25135
LTR	0.64837*	0.25990
CR	0.63843*	0.25015
CLTS	0.61550*	0.25012
CLTR	0.61458*	0.27915
Hostility	-0.26863*	0.17560
Interpersonal Sensitivity	-0.25597*	0.21144
Depression	-0.37318	0.58835*
Somatization	-0.49106	0.52318*
Anxiety	-0.32640	0.47629*
Psychoticism	-0.28464	0.39907*
Additional Items	-0.15881	0.39669*
Phobic Anxiety	-0.31750	0.38438*
Paranoid Ideation	-0.29294	0.36997*
Obsessive-Compulsive	-0.31205	0.34863*
Memory Complaints	-0.21184	0.29700*

Table 12

Discriminant Function Coefficients from Analysis #2

Variable	Function 1 (MDM)	Function 2 (MDP)
PST	0.91067*	-0.39220
GSI	0.72092*	-0.16530
PSDI	0.61636	0.73085*

Table 13

Classification Results of the Two Discriminant Function
Analyses

ANALYSIS #1:

Actual Group	# of cases	Predicted Group Membership		
		MDM	MDP	NC
MDM	40	28 70.0%	6 15.0%	6 15.0%
MDP	18	2 11.1%	14 77.8%	2 11.1%
NC	61	11 18.0%	4 6.6%	46 75.4%

Percent of "Grouped" Cases Correctly Classified: 73.95%

ANALYSIS #2:

Actual Group	# of cases	Predicted Group Membership		
		MDM	MDP	NC
MDM	51	15 29.4%	15 29.4%	21 41.2%
MDP	24	4 16.7%	17 70.8%	3 12.5%
NC	69	6 8.7%	11 15.9%	52 75.4%

Percent of "Grouped Cases Correctly Classified: 58.33%

Table 14

Standardized Canonical Function Coefficients

Variable	Function 1 (MDM)	Function 2 (MDP)
Somatization	-0.54373	0.36382
Obsessive-Compulsive	-0.33879	-0.27073
Interpersonal Sensitivity	-0.03021	-0.39935
Depression	-0.08715	0.59138
Anxiety	0.14849	0.31041
Hostility	-0.08169	-0.37633
Phobic Anxiety	0.26492	0.34011
Paranoid Ideation	-0.36238	0.01164
Additional Items	0.19709	0.16590
LTR	1.65977	1.53709
Total Recall	0.83059	0.64351
Storage Estimate	0.53794	-0.11606
CLTS	-1.25459	-0.93399
CLTR	0.39084	0.33608
Consistent Retrieval	-1.24447	-0.84025
Memory Complaints	0.10062	0.39945
PSDI	0.43675	1.08109
GSI	-0.03077	-0.53100
PST	0.82684	-0.31134

Table 15

T-Test Data by Group for Selection Criteria

Means and Standard Deviations

Measure Control	Demented	Depressed	Normal
GDS			
Mean	8.02	14.33	4.29
SD	5.65	5.23	3.08
Hamilton			
Mean	6.98	11.46	3.67
SD	4.98	7.25	2.61
SDAT Battery			
Mean	+1.174	-1.243	-2.090
SD	0.774	1.100	1.979

T-Values

T-Test Probability	T-Value	Degrees of Freedom	2-Tailed
GDS			
Test 1	-4.75	48	p≤.000
Test 2	8.87	29	p≤.000
Test 3	4.26	72	p≤.000
Hamilton			
Test 1	-2.74	33	p≤.01
Test 2	5.15	25	p≤.000
Test 3	4.36	72	p≤.000
SDAT Battery			
Test 1	9.71	34	p≤.000
Test 2	2.60	73	p≤.01
Test 3	12.57	95	p≤.000

Test 1= Demented vs. Depressed
Test 2= Depressed vs. Normal Control
Test 3= Demented vs. Normal Control

Table 16

T-Test Data by Group for Age and Education

Means and Standard Deviations

Variable	Demented	Depressed	Control
Age			
Mean	75.41	65.75	68.21
SD	9.96	9.84	8.34
Education			
Mean	11.12	13.21	14.36
SD	2.56	1.87	3.13

T-Values

T-Test	T-Value	Degrees of Freedom	2-Tailed Probability
Age			
Test 1	3.95	46	$p \leq .000$
Test 2	-1.10	35	$p \leq .28$
Test 3	4.20	96	$p \leq .000$
Education			
Test 1	-4.02	60	$p \leq .000$
Test 2	-2.15	68	$p \leq .04$
Test 3	-6.29	119	$p \leq .000$

Test 1= Demented vs. Depressed
Test 2= Depressed vs. Normal Control
Test 3= Demented vs. Normal Control

Table 17

Correlations Within BSI Variables

Brief Symptom Inventory

	SM	OC	IS	DP	AX	HS	PA	PI	PS
AI									
SM .39	1.00	.46	.35	.36	.51	.38	.50	.28	.25
OC .37	.46	1.00	.51	.57	.58	.52	.45	.36	.51
IS .40	.35	.51	1.00	.56	.54	.38	.47	.52	.59
DP .48	.36	.57	.56	1.00	.55	.41	.47	.53	.73
AX .39	.51	.58	.54	.55	1.00	.60	.51	.51	.52
HS .32	.38	.52	.38	.41	.60	1.00	.56	.50	.39
PA .37	.50	.45	.47	.47	.51	.56	1.00	.46	.48
PI .37	.28	.36	.52	.53	.51	.50	.46	1.00	.58
PS .41	.25	.51	.59	.73	.52	.39	.48	.58	1.00
AI 1.00	.39	.37	.40	.48	.39	.32	.37	.37	.41

SM= somatization   HS= hostility
OC= obsessive-compulsive   PA= phobic anxiety
IS= interpersonal sensitivity PI= paranoid ideation
DP= depression   PS= psychoticism
AX= anxiety   AI= additional items

All correlations significant at the .01 level.

Table 18

Correlations Within SRT Variables

Selective Reminding Test

	TR	LTR	STR	SE	CLTS	CLTR	CR
TR	1.00	.94	-.42	.92	.93	.89	.94
LTR	.94	1.00	-.70	.97	.99	.92	.99
STR	-.42	-.70	1.00	-.68	-.69	-.62	-.69
SE	.92	.97	-.68	1.00	.97	.87	.94
CLTS	.93	.99	-.69	.97	1.00	.89	.97
CLTR	.89	.92	-.62	.87	.89	1.00	.96
CR	.94	.99	-.69	.94	.97	.96	1.00

TR= total recall   CLTS= cumulative long term
storage
LTR= long term retrieval   CLTR= consistent long term
retrieval
STR= short term recall   CR= consistent retrieval
SE= storage estimate

All correlations significant at the .01 level.

Table 19

Correlations Between BSI Variables, SRT Variables, and Memory Complaints

	MC	TR	LTR	STR	SE	CLTS	CLTR	CR
SM	.17*	-.07	-.09	.07	-.09	-.07	-.07	-.09
OC	.45**	.02	.01	.01	-.00	.02	.00	.00
IS	.11	-.03	-.04	.03	-.01	-.02	-.07	-.06
DP	.36**	-.15	-.15	.11	-.13	-.14	-.19*	-.18*
AX	.22**	-.09	-.09	.08	-.10	-.08	-.08	-.11
HS	.21**	-.07	-.06	.02	-.05	-.04	-.08	-.08
PA	.22**	-.20*	-.18*	.09	-.18	-.16	-.17	-.18*
PI	.16	-.02	-.01	.09	.01	.01	-.03	-.02
PS	.23**	-.12	-.13	.11	-.11	-.11	-.15	-.15
AI	.23**	-.09	-.07	.02	-.06	-.06	-.09	-.09
MC	1.00	-.26**	-.29**	.25**	-.26**	-.29**	-.27**	-.29**

* denotes $p \leq .05$ ** denotes $p \leq .01$

MC= memory complaints
TR= total recall
LTR= long term retrieval

STR= short term recall
SE= storage estimate
CLTS= cumulative long term storage
CLTR= consistent long term retrieval
CR= consistent retrieval

SM= somatization
OC= obsessive-compulsive
IS= interpersonal sensitivity
DP= depression
AX= anxiety
HS= hostility
PA= phobic anxiety
PI= paranoid ideation
PS= psychoticism
AI= additional items

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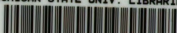
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