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The neuropsychology of depression in the elderly

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THE NEUROPSYCHOLOGY OF DEPRESSION IN THE ELDERLY

by: Jay Weissman

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Abstract

The Neuropsychology of Depression in the Elderly

by Jay Weissman

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The purpose of this study was to investigate the effects of Major Depression on cognitive functioning in nondemented elderly subjects. Hasher and Zacks' "automatic and effortful" paradigm was interfaced with neuropsychological principles in order to provide a conceptual framework. Fifty nondemented elderly participants were equally divided into nondepressed and depressed groups. All subjects were administered the Geriatric Depression Scale, Blessed Information-Memory-Concentration Test, and a full battery of neuropsychological tests. It was hypothesized that the depressed group would perform more poorly than the nondepressed group on tasks that were believed to be effortful. These tasks were described as requiring considerable sustained attention, concentration, effort, and motivation. It was also hypothesized that depressed and nondepressed subjects would perform equally well on automatic tasks. These latter tasks were believed to rely heavily upon overlearned skills, and therefore required minimal attention, concentration, motivation, and effort. With a minor exception, the results of this study largely supported the hypotheses. Implications for appropriate diagnosis and treatment of

depressed elderly are discussed. Possible explanations for lack of support in circumscribed areas of cognitive functioning are provided.

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I. INTRODUCTION

The effect of Major Depression on cognitive functioning, particularly within the elderly, remains poorly understood (Caine, 1986; Kiloh, 1962; Niederehe, 1986; Weingartner, Cohen, Murphy, Martello, & Gerdt, 1981; Wells, 1979). The elucidation of this problem is currently one major challenge facing neuropsychologists and other health care providers of older adults. The importance of resolving this issue can be best understood when health care providers are required to correctly differentiate between dementia, normal aging, and depression, as cognitive deficits are frequently reported concomitantly with each of the aforementioned conditions (Albert, 1981; Caine, 1986; Kaszniak, 1987).

The pattern of cognitive deficits associated with each condition is not without controversy and is frequently not clearly delineated (Albert, 1988a; Caine, 1986; Kaszniak, 1987; Kiloh, 1962; Wells, 1979). The problem is compounded because depression may accompany normal aging and/or dementia (Bulbena & Berrios, 1986; Emery & Breslau, 1989; Reifler, Larson, & Hanley, 1982; Zubenko & Moossy, 1988). As a result of the overlap in symptoms, the diagnostic accuracy of dementia, depression and normal aging in the elderly may be suspect (Caine, 1986; Kaszniak, 1987; Kiloh, 1962; Wells, 1979). Since misdiagnosis could lead to

inappropriate and catastrophic treatment, such as placement in a back ward nursing home rather than treatment for depression at home, clarification of issues leading to better differential diagnosis is in order.

This study will limit its focus to issues pertinent to normal aging and depression. The study of dementia will be left for future research endeavors.

Major Depression

In this section, Major Depression will be defined. Its prevalence rate and correlates will be presented. A focus on studies that describe the absence/presence of cognitive impairment related to depression will be undertaken. As noted previously, differentiating between cognitive impairment related to depression, dementia and normal aging remains an elusive goal. Potential pitfalls in the aforementioned studies will be identified. Finally, psychological models of cognitive impairment related to depression will be reviewed.

Definition

According to the Diagnostic and Statistical Manual of Mental Disorders-III-Revised (DSM-III-R), a major depressive episode includes at least five of the following symptoms which have been on going for at least two weeks and reflect a change from previous functioning: depressed mood, decreased interest in pleasurable activities, significant

weight gain/loss, sleep disturbance, psychomotor agitation/retardation, fatigue/energy loss, feelings of worthlessness, decreased concentration ability, and recurrent thoughts of death/suicide (American Psychiatric Association [APA], 1987).

These criteria notwithstanding, it is not always easy to diagnose the presence of depression in elderly adults (Jenike, 1988). Often, they have been reported to "mask" their depression or to present their depressive symptoms in an atypical manner (Blazer & Williams, 1980; Ouslander, 1982). Furthermore, chronic pain, physical illness, and/or iatrogenic causes (e.g., medication) may help to confound the diagnosis of depression in the elderly (Haggerty, Golden, Evans, & Janowsky, 1988; Jenike, 1988). Yet, Spar and LaRue (cited in Jenike, 1988) asserted that most individuals can be accurately diagnosed using the DSM-III-R criteria.

Rate of Depression

Although studies concerning the relationship between age and depression are somewhat contradictory (Newmann, 1989; Parmelee, Katz, & Lawton, 1989), it is clear that depression is a major health problem for the elderly (Blazer, 1982). It has been estimated that depression may affect nearly one million older Americans (Jenike, 1988). In addition, Sendbuehler and Goldstein reported that while persons over the age of 65 account for approximately 11% of

the total United States population, they also account for 25% of all suicides in this country (cited in Jenike, 1988). Within this context, it is important to note that Murrell, Himmelfarb, and Wright (1983) found that despite the relatively high incidence of depression within their elderly sample, only 3.9% of the males and 3.2% of the females admitted needing help for mental health problems.

Apparently, the incidence of depression among the elderly varies, depending upon the samples, methods, and measures employed (Murrell et al., 1983). Three basic information-gathering techniques have been applied in the study of depression in the elderly. These methods include psychiatric case registers (which are central files that contain patient information about treatment utilization), surveys of institutional and clinical populations, and general population surveys (Blazer, 1983).

Since the elderly are not prone to seek out mental health services (Murrell et al., 1983), it appears that the psychiatric case register would tend to underestimate the prevalence of depressive disorders, especially within the elderly (Blazer, 1983). Surveys of institutional and clinical populations/facilities are preferred over psychiatric registers because uniform methods of case identification are used. However, this technique can lead to either under or over estimation of the rate of depression (Blazer, 1983). The general population survey, which is the

only direct means of assessment is the preferred one for obtaining estimates concerning geriatric psychopathology (Blazer, 1983).

In one study of community based individuals, Blazer and Williams (1980) surveyed a stratified random sample of elderly residents in Durham, North Carolina who were 65 years of age and older. These individuals were drawn from a list of subjects who participated in another survey several years earlier. Blazer and Williams (1980) used a short form of the Minnesota Multiphasic Personality Inventory and the Older American Resources and Services (OARS) Depressive Scale to interview and diagnose the participants in their study according to criteria from the Diagnostic and Statistical Manual of Mental Disorders-III (APA, 1980). They found that 14.7% of their sample suffered from significant depressive symptoms. In addition, 3.7% of this same sample was reported to be suffering from a major depressive disorder (Blazer & Williams, 1980).

In another investigation of community residents, Weissman and Myers (1978) surveyed 511 participants from a previous study who were 18 years of age and older. Of this group, 111 were 66 years old or older. Participants were interviewed with the Schedule for Affective Disorders and Schizophrenia-Research Diagnostic Criteria (SADS-RDC) which was developed by Spitzer, Endicott, and Robbins (cited in Weissman & Myers, 1978). It was found that the current rate

for Major Depression among the elderly was 5.4%. Minor depression (according to the RDC) was noted to be present in 2.7% of this elderly group.

Murrell et al., (1983) also studied the prevalence of depression among community based elderly in Kentucky, aged 55 years and over. These authors employed a stratified sampling technique to interview approximately 2500 subjects with the Center for Epidemiologic Studies Depression Scale (CES-D). These authors found that 13.7% of the males and 18.2% of the females in their sample were above the cutoff score of 20 for significant depressive symptomatology (Murrell et al., 1983).

In another area somewhat less researched, Parmelee et al., (1989) investigated the rate of geriatric depression within congregate apartments and a nursing home setting. Seven hundred and eight residents who completed the Geriatric Depression Scale (Yesavage et al., 1983) were rated by observers (i.e., Raskin Depression Scale, cited in Parmelee et al., 1989), and given a diagnosis by psychiatrists using DSM-III-R criteria. These investigators found that 12.4% of the subjects in their sample suffered from Major Depression, with an additional 30.5% of the sample suffering from significant but less severe depressive diagnoses (Parmelee et al., 1989).

Also, there appear to be gender differences in older adults with regard to rates of depression. This finding is

buttressed by Krause (1986) who found that older women tend to be significantly more depressed than older men although the latter group is more likely to attempt suicide (Blau, 1983). In addition, older women were found to report more depressed affective symptoms along with increased somatic symptoms than older men (Krause, 1986).

Correlates of Depression

Correlates of depression in the elderly were investigated by Murrell et al., (1983). They found significant relationships for males and females between depression and age, education, income, housing quality, marital status, and health, with the strongest association occurring with respect to health. Within the male group, depression increased with age and number of rooms in a dwelling, and decreased with education and income. Also, men who owned their houses tended to be less depressed than those who rented. Urban residents appeared less depressed than non-urban residents. Never married and married men had the lowest rates of depression, while separated, divorced and widowed men had the highest rates. Finally, depression increased significantly with poor health (Murrell et al., 1983). The findings for older women basically coincided with the findings for older men but with minor variations. For example, depression appeared greatest for the youngest and oldest women in this study. In addition, relationships with socioeconomic status were not as strong for women as

they were for men, and there was no rural/non-rural difference noted (Murrell et al., 1983).

Of all the correlates of depression mentioned above, physical health/illness plays a particularly important role in the presence/absence of depression in the elderly (Ouslander, 1982). For example, it has been reported that 85% of elderly persons who committed suicide also had an active physical illness, and this illness was thought to have contributed to suicide in 70% of these cases (Ouslander, 1982).

Medical conditions often associated with depression include metabolic disturbances, endocrine disorders, viral infections, bacterial infections, cardiovascular disorders, pulmonary disorders, gastrointestinal disorders, genitourinary disorders, metal intoxication, musculoskeletal disorders, and neurologic disorders (Haggerty et al., 1988; Ouslander, 1982; Sweer, Martin, Ladd, Miller, & Karpf, 1988). Additional confirmatory evidence that depression and physical illness are clearly linked is documented in a number of studies. For instance, Sweer et al. (1988) studied the incidence of newly discovered medical problems in 100 hospitalized elderly patients who were treated for depression. In this group, 52% of this population had at least one unsuspected medical problem with the average patient having .77 newly discovered medical problems, many of which are listed above.

Finally, Harris, Mion, Patterson, and Frengley (1988) evaluated 30 elderly medical rehabilitation patients for depression one week after admission and at time of discharge. Results indicated that 25 patients on admission and 14 on discharge suffered from significant depressive symptomatology. All patients whose mood improved also improved in physical functioning.

Ironically, many drugs used to treat the physical illnesses mentioned above can cause symptoms of depression in the elderly. They include alcohol, antihypertensives, analgesics, antiparkinsonian agents, antimicrobials, beta blockers, cardiovascular agents, hypoglycemic agents, steroids, neuroleptics, benzodiazepines, anti-seizure medications, antihistamines, and cancer chemotherapeutic agents (Jenike, 1988; Ouslander, 1982).

Given these findings, it would be advisable for elderly patients to undergo regular medical check-ups that would include a physical examination and a laboratory evaluation (Sweer et al., 1988).

Effects of Depression on Cognitive Functioning

The research literature concerning the relationship between depression and cognitive functioning within the elderly is conflicting, controversial and poorly understood (Caine, 1986; Niederehe, 1986; Raskin, 1986). Numerous studies have revealed clear and significant deficits in various areas of cognitive functioning (Bower, 1981;

Breslow, Kocsis & Belkin, 1981; Byrne, 1977; Fogarty & Hemsley, 1983; Hart, Kwentus, Taylor, & Harkins, 1987; Hart, Kwentus, Wade, & Hamer, 1987; Henry, Weingartner, & Murphy, 1973; LaRue, D'Elia, Clark, Spar, & Jarvik, 1986; Pettinati & Bonner, 1984; Raskin, Friedman, & DiMascio, 1982; Reisberg, Ferris, Georgotas, de Leon, & Schneck, 1982; Silberman, Weingartner, Laraia, Byrnes, & Post, 1983; Silverstein, McDonald, & Meltzer, 1988; Sternberg & Jarvik, 1976).

However, a number of studies have indicated an absence of cognitive deficits secondary to depression (Alvarez, 1962; Cavanaugh & Wettstein, 1983; Hart, Kwentus, Wade, & Taylor, 1988; Kahn, Zarit, Hilbert, & Niederehe, 1975; Niederehe & Camp, 1985; Popkin, Gallagher, Thompson, & Moore, 1982). Furthermore, additional studies concerning the effects of depression on cognition have revealed minimal and/or very limited cognitive changes (Donnelly, Waldman, Murphy, Wyatt, & Goodwin, 1980; Emery & Breslau, 1989; Frazer, Glicksman, Sands, & Libon, 1988; Frazer, Levine, & Libon, 1989; Johansen, Gustafson, & Risberg, 1985). Within circumscribed cognitive domains such as attention, language, memory, visuospatial ability, and abstraction/set maintenance, these inconsistencies remain.

A more detailed review of many of the above mentioned studies will now be undertaken. In addition, studies involving the tests employed in this investigation will be

discussed.

Attention. Byrne (1977) studied groups of neurotics, psychotic depressives, and normals who ranged in age from 22 to 67 years. A significant negative relationship was found between depression and vigilance performance as measured by one's ability to discriminate between relevant and irrelevant groups of orally presented numbers; this test assesses a form of attentional ability (Albert, 1988b).

However, Cavanaugh and Wettstein (1983) found no effect for depression on tests of attentional abilities as measured by a mental status questionnaire for medical inpatients who ranged in age from 17 to 88. Also, the work of Frazer et al. (1989) tended to support the findings of Cavanaugh and Wettstein (1983), as elderly community and nursing home subjects' performance on the Digit Span subtest of the WAIS was found not to be impaired secondary to depression.

Trail Making Test

The Trail Making Test is a paper and pencil task that relies heavily upon motor speed and attentional abilities (Berg, Franzen, & Wedding, 1987; Lezak, 1983). It is administered in two parts, A and B (Reitan & Wolfson, 1985). In part A, subjects are required to draw lines that connect circles numbered from 1 to 25 in a consecutive fashion. Part B contains 15 circles, which are numbered from 1 to 8 and lettered A to G. Persons are required to draw connecting lines from one circle to another in a consecutive

manner, but to alternate between lettered and numbered circles. Scoring is based upon time needed to correctly complete each part (Reitan & Wolfson, 1985).

A number of studies have indicated a significant negative relationship between Trail Making Test performance and depression. For example, decrements in test performance on the Trail Making Test have been noted for a mixed group (unipolar and bipolar) of inpatient depressives, elderly depressives, and a mixed group (endogenous and nonendogenous) of inpatient and outpatient depressives (Fisher, Sweet, & Pfaelzer-Smith, 1986; Gray, Rattan, & Dean, 1986; Rush, Weissenburger, Vinson, & Giles, 1983; Shipley et al., 1981).

However, other studies have found no significant relationship between depression and performance on the Trail Making Test. For instance, no significant effect for depression was found on Trail Making Test performance for groups of depressed geriatric patients, depressed inpatients, medicated depressed patients, depressed substance abusers, and depressed physically ill patients (Clark, Pisani, Aagesen, Sellers, & Fawcett, 1984; Freidenberg et al., 1989; Gurland et al., 1988; Pettinati & Bonner, 1984). Consequently, a definitive statement concerning the effect of depression on Trail Making Test performance remains elusive.

Stroop Color and Word Test

The Stroop Color and Word Test is a measure of verbal fluency, cognitive flexibility, and general cognitive efficiency (Berg et al., 1987; Golden, 1978; Lezak, 1983). This test consists of 3 pages. The first page has only the words red, green, and blue printed in black ink. The order of the words is random, although no word follows itself. The second page consists of the sequence xxxx which is printed in red, green, or blue ink. The order of the colors is also random, although no color follows itself. The third page is a blend of pages and 1 and 2. However, a color and word do not match (i.e., The word blue may be printed in red or green ink.). On page 1, the subject is instructed to read the words as quickly as he/she can, going down each column. On page 2, the subject is required to name the color of the xxxx sequence as quickly as he/she can, again going down each column. Finally, on the third page, the subject is required to name the color of the ink as quickly as he/she can, rather than to read the word, going down each column. For each page, the score is the number of items finished correctly within a 45 second time limit.

There have been a number of studies that have demonstrated a significant negative relationship between Stroop Color and Word Test performance and depression. For instance, mildly anxious and depressed outpatients, depressed female volunteers, depressed patients, and

depressed elderly female inpatients were found to perform more poorly on this test when composed to normative data and/or control groups (Bucci & Freedman, 1981; Mathews and MacLeod, 1985; Williams & Broadbent, 1986; Williams & Nulty, 1986).

However, there have been an almost equal number of studies that have not demonstrated a significant relationship between Stroop Color and Word Test performance and depression. For example, depressed outpatient polio victims, female undergraduate student volunteers who underwent mood induction techniques, depressed inpatient alcoholics, and unipolar endogenous/nonendogenous depressed patients test performance was found not to be significantly different from control groups and/or normative data (Freidenberg et al., 1989; Hale & Strickland, 1976; Rozensky & Honor, 1984; Rush et al., 1983). Based upon the aforementioned studies, no clear conclusion can be drawn concerning the effects of depression on Stroop Color and Word Test performance.

Language. It appears that little has been done to study the effects of depression on language functioning. Based on the limited number of investigations within this area, it is difficult to draw any conclusions.

In their study of elderly unipolar major depressives, Senile Dementia of the Alzheimer's Type patients, and normal elderly, Emery and Breslau (1989) found that depressives did

more poorly than normals on only the most complex language measures of the Western Aphasia Battery which includes measures of auditory verbal comprehension, repetition, naming, syntax, and reading.

In contrast, Frazer et al., (1988, 1989) found no effect for depression when studying a large number of elderly community and nursing home residents on various measures of language functioning. These subjects were administered subtests from the Boston Diagnostic Aphasia Examination and the Boston Naming Test (Goodglass & Kaplan, 1983).

Boston Naming Test

The Boston Naming Test is a confrontation naming vocabulary test that consists of 60 pen and ink drawings of objects that are ordered from easiest (i.e., bed) to most difficult (i.e., abacus) which appear in a spiral bound booklet. The subject is required to name a pictorial object within 20 seconds of its initial presentation. If his/her response is incorrect, then cues are provided to facilitate performance. Test administration is terminated after 6 consecutive failures (Goodglass & Kaplan, 1983).

Only a small number of studies have investigated the effects of depression on Boston Naming Test performance. Results have typically been unclear. For example, Speedie, Rabins, Pearlson, and Moberg (1990) compared a group of depressed/nondemented elderly volunteers with groups of

nondepressed/demented and depressed/demented elderly subjects on the Boston Naming Test. Although the depressed/nondemented group performed significantly better than both demented groups, little could be said about the effect for depression since a nondepressed/nondemented group was not employed in this study. In another study, Beatty, Goodkin, Monson, Beatty, and Hertsgaard (1988) compared a mixed group of chronic progressive multiple sclerosis patients (which included depressed and nondepressed subjects) with a normal control group on the Boston Naming Test. Although the normal control group performed significantly better than the group containing multiple sclerosis patients, the full effect for depression was not clear given the heterogeneity of the experimental group.

The Token Test

The Token Test is used to assess auditory language comprehension (Boller & Vignolo, 1966; De Renzi & Vignolo, 1962). It consists of 20 tokens, half are circles and half are squares. In addition, these tokens come in large and small sizes and appear in red, blue, green, yellow, and white colors. Auditory commands presented by the examiner require the subject to touch, pick up or manipulate various combinations of the tokens.

The results of studies employing The Token Test have also been unclear. For example, Morice and McNicol (1985) compared groups of schizophrenics, bipolar depressives,

(manic type) and normals on a new version of The Token Test. Results indicated that both psychiatric groups performed more poorly when compared to the controls. However, the effect of Major Depression was not addressed. In another study, Faber and Reichstein (cited in Morice & McNicol, 1985) found that depressives performed no differently from normal controls on The Token Test.

Memory. Most research which focuses on depression and its effect on cognition deals with memory functioning (Niederehe, 1986). However, despite the relatively large numbers of studies completed within this area, few firm conclusions can be made at this time.

In largely quantitative studies of memory, it was found that depressives recalled fewer details on free recall and serial tasks than normals (Breslow et al., 1981; Frazer et al., 1989; Hart, Kwentus, Wade, & Hamer, 1987; Henry et al., 1973; LaRue et al., 1986; Raskin et al., 1982; Silberman et al., 1983; Sternberg & Jarvik, 1976). In addition, some qualitative studies of memory have also found significant effects for depression. For example, Fogarty and Hemsley (1983) studied inpatients and outpatients at a psychiatric hospital whose ages ranged from 20 to 65 years. They found that depressed individuals tended to recall more sad/negative memories of events than their nondepressed counterparts. Bower (1981), who induced sad moods via hypnosis in college students found results similar to

Fogarty and Hemsley (1983). Breslow et al. (1981) compared 21 hospitalized depressed patients with controls on a story recall paradigm. All subjects were 18 years of age and older. They found that depressed individuals who exhibited a memory deficit typically were lacking in ability to recall positive events.

Other studies on memory functioning and depression have found no effect for depression. For example, Niederehe and Camp (1985) studied 57 elderly depressed subjects using a signal detection task. No effect for depression was found when compared to controls. In another study, Popkin et al. (1982) investigated complaints and performance in depressed and nondepressed samples of elderly community residents. These authors did not find differences between normal and depressed individuals on recall tasks. Finally, Kahn et al. (1975) also found no differences on memory tests between depressives and normals. However, all three studies did note that depressed individuals tended to complain more about their self perceived lack of memory functioning than the non-depressed individuals.

California Verbal Learning Test

The California Verbal Learning Test (CVLT) is a relatively new instrument that assesses one's ability to learn verbal material. This test requires a subject to recall lists of words under immediate and delayed recall

conditions, with and without cues (Delis, Kramer, Kaplan, & Ober, 1987).

With regard to the effects of depression on CVLT performance, no firm conclusion can be made as few studies have been completed within this area. For instance, Hoff et al. (1990) compared young bipolar disorder (manic type) patients with a young mixed diagnostic group of schizophrenic patients on a large number of neuropsychological measures, including the 16 word version of the CVLT. No significant differences on any of the test variables were evident between groups. In another study, Massman, Delis, Butters, Dupont, and Gillin (1991) compared 5 groups of psychiatric and neurological patients (ages ranged from the 40s to the 60s) with a normal control group (average age was 46 years) on the 16 word version of the CVLT. It was found that the CVLT was able to successfully differentiate among normals, Huntington's Disease patients, and Alzheimer's Disease patients, but not with the unipolar depressed group. The only reported study using the 9 word version of the CVLT found that elderly depressives (a nondescript group) performed more poorly then normals (Mattson, Libon, Levine, & Socha, 1991).

Biber Figure Learning Test

The Biber Figure Learning Test (BFLT) is an instrument used to assess visual memory. It consists of 10 moderately complex geometric designs that appear one per page in a

spiral bound booklet. The administration of the BFLT consists of six assessment conditions which require the subject to reproduce these geometric designs via paper and pencil under immediate and delayed recall conditions. There are also immediate and delayed recognition conditions (multiple choice) in this test (Glosser, Biber, & Goodglass, 1988; Glosser, Goodglass, & Biber, 1989).

Currently, there are no reported studies that have investigated the effects of depression on BFLT performance.

Visuospatial Ability. Again, research findings are mixed in this area. For example, Frazer et al. (1988) found performance decrements on a mosaic tile reconstruction task (a variation of the Block Design subtest on the WAIS) for depressive elderly subjects who lived in community and nursing home settings.

However, Cavanaugh and Wettstein (1983) studied depressed medical inpatients using a mental status questionnaire that included constructional tasks (Although not clearly specified, the constructional tasks were most likely paper and pencil drawings.). These authors found no differences between depressives and normal subjects on this task. In another study completed by Frazer et al. (1989), these researchers found no differences between normal and depressed elderly community and nursing home residents on paper and pencil drawings and on mosaic tile reconstruction tasks.

Block Design

The Block Design subtest is a measure of visuoconstruction functioning. It is particularly sensitive in discriminating individuals with visuospatial deficits and brain damage (Lezak, 1983). Depending on the level of complexity, four or nine red and white blocks are used by subjects to construct replicas of geometric designs that are originally presented in picture or block form. As testing progresses, the geometric forms become increasingly difficult to replicate. Test administration is terminated after three consecutive failures (Wechsler, 1981).

A considerable number of studies have focused upon the effects of depression on Block Design subtest performance. However, not unlike other tests described in this section, the results of these studies have been mixed and inconclusive. For example, a large number of studies have found a significant negative relationship between depression and Block Design subtest performance for children and adults (Blumberg & Izard, 1985; Kaslow, Rehm, & Siegel, 1984; Perlmutter & Nyquist, 1990; Staton, Wilson, & Brumback, 1981).

However, a large number of studies have not revealed a significant relationship between depression and Block Design subtest performance. For instance, investigators found a nonsignificant relationship between depression and Block Design test performance in groups of mildly depressed

hypoxemic patients, medicated depressives, and bipolar depressed patients (Hoff et al., 1990; Howard, Hogan, & Wright, 1975; Prigatano, Parsons, Levin, Wright, & Hawryluk, 1983).

Judgment of Line Orientation

The Judgment of Line Orientation is a measure that assesses one's ability to discriminate the direction or angulation of lines. The test requires an individual to match different pairs of shortened angled lines that appear on an upper display card to full length angled pairs of lines that appear within a group of 11 angled lines on a lower display card (Benton, Hamsher, Varney, & Spreen, 1983; Benton, Varney, & Hamsher, 1978; Eslinger & Benton, 1983).

At this time, there have been no reported studies that have investigated the effect of depression on the Judgment of Line Orientation test performance.

Abstraction and Set Maintenance. Not surprisingly, results within this area are also rather inconclusive. For example, Donnelly et al. (1980) investigated abstraction ability in 65 hospitalized depressed patients (whose average age was 44 years) and in 49 controls on the Category Test from the Halstead Reitan Neuropsychological Test Battery. They found that this ability was impaired for bipolar depressed individuals but not for unipolar depressed subjects when compared to normals. In contrast, Frazer et al. (1989) found no significant difference between groups of

heterogeneous depressed and nondepressed community and nursing home residents on the Similarities subtest from the WAIS.

Conflicting results from studies concerning set maintenance ability also exist. Many of these studies employed the Trail Making Test. These results were reported earlier in this section and will not be repeated here.

Methodological Problems in Studies of Depression

Although many investigations have been completed on depression and its effect on cognitive functioning, few firm conclusions can be drawn (Caine, 1986). Methodological problems inherent in these studies are frequently responsible for this lack of knowledge. Miller (cited in McAllister, 1983) criticized investigations because they employed very little theoretical orientation that could help to explain how depression affects cognition (Fisher et al., 1986; Rush et al., 1983). Also, many of these authors did not clearly define the nature of the depressive sample being studied, and have made little effort to classify subtypes of depression on the basis of patterns of cognitive deficits (Byrne, 1977; Cavanaugh & Wettstein, 1983; Hart, Kwentus, Taylor, & Harkins, 1987; Hart, Kwentus, Wade, & Hamer, 1987; Henry et al., 1973; Johansen et al., 1985; Niederehe & Camp, 1985; Pettinati & Bonner, 1984; Sternberg & Jarvik, 1976.) It is not known if certain subtypes of depression can cause

specific variations in cognitive functioning (McAllister, 1983).

An additional potential problem is the investigators' use of volunteer subjects and/or unclear methods of sample selection (Byrne, 1977; Emery & Breslau, 1989; Frazer et al., 1989; Johansen et al., 1985; Niederehe & Camp, 1985; Pettinati & Bonner, 1984). Generalizability can be seriously limited when using non-representative samples.

Small sample size presents additional problems for studies on depression and cognitive functioning in the elderly (Byrne, 1977; Hart, Kwentus, Wade, & Taylor, 1988; Johansen et al., 1985; Popkin et al., 1982). For example, the effect of depression may be more difficult to detect; also, there may be serious limitations in one's ability to generalize the findings of a particular investigation.

Another significant problem noted is the absence of control groups (Reisberg et al., 1982) which seriously impairs one's ability to assume any causal role to the independent variable under investigation.

It has also been noted that researchers have used heterogeneous age groups (Alvarez, 1962; Raskin et al., 1982; Silverstein et al., 1988) and/or did not specify the age of their sample population (Sternberg & Jarvik, 1976); this results in a problem for generalizability.

Finally, it should be noted that inconsistencies in research findings may, in part, result from the use of

different assessment instruments which most likely measure different although similar cognitive abilities (Raskin, 1986).

Psychological Models of Cognitive Impairment

Despite the inconsistencies and methodological problems found in many studies of depression and cognitive functioning among the elderly, a number of researchers have attempted to explain their significant findings using the information processing model (Weingartner, 1986). This approach assumes that an individual actively participates in the learning and decision making processes, that the effectiveness of one's learning can be assessed, and that an individual's response can be divided into meaningful theoretical stages for analysis. For example, the assessment of memory can be divided into processes of encoding, storage, and retrieval of information (Kaszniak, Poon, & Riege, 1986).

Another theoretical model is the mood state dependent learning paradigm. Basically it is thought that a person's mood will determine what will be learned and remembered since an individual will tend to recall more items consistent with his/her own current mood state at that time (Bower, 1981; Fogarty & Hemsley, 1983). Support for this model also comes from studies on mood congruent learning (Breslow et al., 1981) and attention (Kelley, 1986).

Other explanations for cognitive impairment assumed to result from depression include: attentional difficulties, problems with encoding and/or with retrieval of information, reduced cognitive capacity, and motivational disturbances (Beck, Rush, Shaw, & Emery, 1979; Breslow et al., 1981; Henry et al., 1973).

Although numerous hypotheses have been developed in an attempt to explain the effects of depression on cognitive functioning, the one of greatest interest in this experiment is based on the work of Hasher and Zacks (1979) and elaborated upon by Weingartner (1986) and his colleagues (Cohen, Weingartner, Smallberg, Pickar, & Murphy, 1982; Henry et al., 1973; Weingartner, Cohen, Bunney, Ebert, & Kaye, 1982; Weingartner et al., 1981; Weingartner, Kaye, Smallberg, Cohen, Ebert, Gillin, & Gold, 1982). This paradigm focuses upon the "automatic and effort demanding" cognitive processes associated with depression (Weingartner, 1986).

An individual's mood state and level of arousal are considered key determinants of the amount of effortful information processed (Cohen et al., 1982). It is believed that when a person becomes depressed, he/she experiences a deficit in his/her central motivational state (Beck et al., 1979; Weingartner, 1986). This development, in turn, causes cognitive changes that are apparent on effort demanding tasks (Cohen et al., 1982; Henry et al., 1973; Weingartner,

1986). For instance, a depressed individual will have decreased ability to regulate the flow of information and to make an appropriate behavioral response (Hasher & Zacks, 1979). A greater decrement in cognitive performance will be expected as the effort to perform a task increases (Cohen et al., 1982; Weingartner, 1986; Weingartner et al., 1981). According to Hasher and Zacks (Weingartner, 1986, p. 220), an effort demanding process "is one that is sensitive to motivation, and reinforcement, set, attention, intention and alertness and that would alter performance on effort demanding tasks."

Furthermore, effort demanding tasks are thought to be more easily disrupted and are not independent of other behaviors that require sustained effort. For example, if attention is shared with another activity, performance on the effort demanding task will suffer (Weingartner, 1986). Also, performance on effort demanding tasks seem to include individual variation between and within subjects (Cohen et al., 1982). Finally, Weingartner (1986) speculated that effort demanding tasks are regulated by areas of the brain that control arousal and activation, which include the subcortical and limbic system structures. Parenthetically, from a neuropsychological perspective, effortful tasks may also be conceptualized as having a strong executive function component. Such tasks require one or more of the following conditions: 1) maintenance of set (i.e., ability to attend

to a particular task and stay within its parameters until completion); 2) mental manipulation (i.e., simultaneous ability to attend and to ignore competing stimuli); and 3) assembly of ambiguous parts into a coherent whole (i.e., as in the construction of geometric forms which relies on scanning, planning and self-editing abilities). For a more detailed review of the these concepts see Luria (1980).

In contrast to effort demanding tasks, it is believed that automatic cognitive processes are relatively spared in depression (Cohen et al., 1982; Weingartner, 1986). Automatic cognitive operations are defined as overlearned tasks that require little sustained effort. Basically, automatic cognitive process are believed to be performed equally well, when under incidental conditions (events that do not require awareness or intention) or when required to focus on a particular task (Hasher & Zacks, 1979; Weingartner et al., 1981).

Automatic cognitive processes can be completed simultaneously, with little if any decrement in performance noted (Weingartner, 1986). These processes are hypothesized to be "wired in" to subjects and are species specific (Cohen et al., 1982). Finally, automatic processes are postulated to be related to neocortical structures which are largely involved with the storage and retrieval of information (Weingartner, 1986). However, this hypothesis has not been tested within the laboratory at this time (Weingartner,

1986). Therefore, from a neuropsychological perspective, automatic tasks may be thought of as having little or no reliance upon executive functions (see Luria, 1980).

Weingartner (1986) believes that in depression, cognitive impairments can occur under a variety of circumstances, such as in the acquisition and retrieval of information, motor output, and conceptual learning. Support for this model largely comes from several experiments (Cohen et al., 1982; Weingartner, 1986). However, all of these experiments employed a sample size of 11 or fewer subjects which could mean a non-representative sample. Also, in at least one of the experiments (Cohen et al., 1982), a mixed group of depressive subtypes (i.e., bipolar and unipolar depression) was employed in the sample; this is a source of confounding. In addition, volunteers were employed in at least two of the experiments (Cohen et al, 1982; Weingartner, 1986), which could lead to a nonrepresentative sample. Finally, it is important to note that in at least one experiment, the age for subjects was 19-53 years (Cohen et al., 1982). Ages of the subjects in several of the experiments were not revealed. This is significant in view of this experimenter's emphasis upon a geriatric population.

Summary

In summary, depression is a major health problem for the elderly (Blazer, 1982). The effects of depression on cognitive functioning within the elderly is not well

understood (Caine, 1986; Niederehe, 1986; Raskin, 1986). For example, the effects of depression on circumscribed cognitive areas such as attention, language, memory, visual spatial ability, and abstraction/set maintenance are mixed and for the most part inconclusive.

Methodological problems encountered in research studies may account for a large part of these inconsistencies. Employing small sample sizes, mixed groups of depressives, undesirable subject selection practices, and heterogeneous age groups, may have contributed to this relative lack of knowledge within this area.

Although a number of psychological models have been proposed in an attempt to explain cognitive impairment related to depression, the one of most interest in this experiment is the "automatic and effort demanding" paradigm posited by Hasher & Zacks (1979).

Normal Aging

In this section, biological theories and physical characteristics of aging will be discussed. Also, methodological problems encountered in research studies on the elderly will be addressed. Cognitive functioning of the normal elderly will be examined. Finally, the effect of normal aging on psychological tests employed in this study will be reviewed.

The average life expectancy during prehistoric times was approximately 18 years (Hayflick, 1987). Until the early 1880s, the average life expectancy of an individual was between 30 and 40 years (Albert, 1988a). It was not until the late 1880s and early 1900s that the average life expectancy approached 50 years (Albert, 1988a).

During this latter time period, Americans who were 65 years and older represented approximately 4% of the total United States population (Albert, 1988a). As a result of improved public health measures such as sanitation and sewage treatment, improved nutrition, and the development of antibiotics (Albert, 1988a) life expectancy in the United States and in other developed countries is now approximately 75 years (Hayflick, 1987). Americans who are 65 years and older now constitute about 10 to 11 percent of the 250 million individuals in this country (Albert, 1988a). By the year 2000, the percentage of older Americans is expected to increase to about 17% of the total population (Albert, 1988a). With the rise of life expectancy, and concomitant increase in the number and percentage of elderly individuals in this country, comes interest in the study of cognitive functioning of the "normal elderly."

Biological Theories

Of special interest to gerontologists are biological theories of aging (Hayflick, 1987). Typically, these theories can be divided into two basic classes: those that

view aging as genetically determined and those that see aging as resulting from cellular damage (Hayflick, 1987; Zarit & Zarit, 1987). Despite the fact that biological (and other disciplines) theories about aging are incomplete (Zarit & Zarit, 1987), it is clear that cellular and genetic changes result in changes in the individual's physiological system (Albert, 1988a; Cummings & Benson, 1983; Zarit & Zarit, 1987).

Physical Changes Characteristic of Aging

For the most part, it has been reported that many physiological functions begin to decline in the person's late 20s or early 30s and these changes can be either linear and/or nonlinear in nature (Albert, 1988a). One of the most apparent physiological changes that results from aging is one's appearance. For example, hair loss, the greying of one's hair, and changes in nail growth, skin texture, muscle size, and in height are considered to be a normal part of aging (Zarit & Zarit, 1987). Cardiovascular changes have also been reported in the course of normal aging. For instance, it has been noted that there is stiffening of the collagen that surrounds muscle fibers, decreased cardiac output and an increased heart size (Albert, 1988a; Zarit & Zarit, 1987). There are changes in the respiratory system with increasing age. Older individuals often experience shortness of breath (Albert, 1988a; Zarit & Zarit, 1987). Sensory perceptual and motor deficits have been reported in

the elderly. For example, decreased vision, impaired hearing, a decline in the ability to taste and smell, and abnormalities of station and gait have been reported (Cummings & Benson, 1983; Zarit & Zarit, 1987). Finally, disturbances in sleep patterns (i.e., insomnia), and within the gastrointestinal, excretory, and endocrine systems are frequently the norm for older individuals (Cummings & Benson, 1983; Zarit & Zarit, 1987).

Despite the plethora of reported physiological changes that accompany normal aging, great variability among individuals exists (Albert, 1988a; Zarit & Zarit, 1987). The causes of this variation may include normal aging and/or disease processes that are not considered normal but are frequently associated with the elderly population (Albert, 1988a; Zarit & Zarit, 1987).

Methodological Considerations

Although there is a general consensus within the geriatric field that cognitive functioning declines with normal aging (Albert, 1988b; Albert & Heaton, 1988), there is less agreement about the magnitude of the cognitive decline and the age at which it occurs (Albert & Heaton, 1988). In part, this discrepancy is thought to result from the type of research design employed i.e., cross sectional versus longitudinal designs (Albert, 1988a; Benton & Sivan, 1984; Poon, Krauss, & Bowles, 1984) and also from the

effects of such subject variables as gender, health, education, and verbal intelligence (Poon et al., 1984).

Cross-sectional studies are the most frequent ones employed (Albert, 1988a), but are thought to accentuate age differences on measures of psychological test performance (Albert, 1988a; Benton & Sivan, 1984). It would appear that cohort differences in educational, health, nutritional, and sociocultural backgrounds account for much of the variance in test scores (Albert, 1988a; Benton & Sivan, 1984; Poon et al., 1984).

In contrast to cross sectional studies, longitudinal studies have been reported to minimize age differences on psychological tests (Albert, 1988a; Benton & Sivan, 1984). Kleemier (cited in Albert, 1988a) found that the group of individuals who did not return for subsequent retesting in a longitudinal study typically had performed more poorly than those individuals who did return. Physical illness, relocation, cognitive dysfunction, and death often play an important role in preventing the recontacting and retesting of individuals over time (Albert, 1988a).

Since cross sectional studies tend to be the most popular ones within gerontological research, Poon et al. (1984) made suggestions about how to minimize problems associated with such subject variables as gender, health, education, and verbal intelligence. These recommendations included: generalizing to the population must be limited to

the gender employed in the study, randomly sampling as widely as possible from the elderly population to account for the large range of possible health related problems, proposing quantitative and qualitative formulas to account for different types of informal learning (i.e., self taught/business), and restricting the generalizations of research findings because they should be limited to the ability level (i.e., verbal intelligence) of the groups investigated (Poon et al., 1984).

Cognitive Functioning in Normal Aging

Early studies of the cognitive functioning of older adults have typically focused on the Wechsler Adult Intelligence Scale (WAIS; Botwinick, 1978; Wechsler, 1955). This test consists of both Verbal and Performance subtests. Numerous studies on the WAIS have led to the formulation of the "classic aging pattern," in which the elderly do better on Verbal subtests than on Performance subtests (Botwinick, 1978). In fact, it had been noted that decline in performance on the Verbal subtests by normal elderly usually does not exceed one standard deviation until the age of 80 (Albert & Heaton, 1988). However, decline on Performance subtests by the elderly was noted to exceed one standard deviation by the age of 60 (Albert & Heaton, 1988). The rank ordering of WAIS subtests with regard to the degree of performance decline included (from most to least) Digit Symbol, Picture Arrangement, Block Design, Similarities,

Digit Span, Object Assembly, Picture Completion, Arithmetic, Comprehension, Vocabulary, and Information (Botwinick, 1978). Interestingly, recent studies on the revised version of the WAIS, the Wechsler Adult Intelligence Scale-Revised (WAIS-R; Wechsler, 1981) have revealed a similar pattern of cognitive decline (Albert & Heaton, 1988).

Numerous attempts have been made to explain the Verbal-Performance subtest differences (Albert & Heaton, 1988; Botwinick, 1978, 1981; Lezak, 1983; Storandt, Botwinick, & Danziger, 1986). For example, it was initially believed that because the elderly are somewhat slower (Botwinick, 1978) than their younger counterparts, they would do more poorly on Performance subtests which are timed than on Verbal subtests which are for the most part untimed (Albert & Heaton, 1988). However, Klodin (cited in Albert & Heaton, 1988) found that providing elderly people with additional time to complete the WAIS subtests resulted in a small but insignificant improvement in their test performance; the Verbal-Performance discrepancy remained.

Another attempt to resolve this discrepancy involved the differentiation between "fluid" and "crystallized" intelligence (Albert & Heaton, 1988; Botwinick, 1981). "Crystallized" intelligence was thought to be acquired knowledge that resulted through formal learning and life experience, and occurred principally in one's early years (Albert & Heaton, 1988; Botwinick, 1981). "Fluid"

intelligence, however, was seen as relying upon biological factors only, including an intact central nervous system (Albert & Heaton, 1988). It was therefore postulated that random insults (caused by high blood pressure, strokes, alcoholism, etc.) to the central nervous system over time resulted in decreased Performance subtest scores and lowered "fluid intelligence; "crystallized" intelligence and Verbal subtest scores were presumed not to be as affected (Albert & Heaton, 1988).

Still other investigators have proposed that the classic aging pattern is a rather selective process that implicates more right hemisphere functions than left hemisphere ones. For example, Schaie and Schaie (1977) compared patients with known right hemispheric damage with older adults. They concluded that the WAIS test profiles of both groups were indeed similar. However, these findings may have been compromised as a result of test interpretation. Subtests identified as sensitive to right hemispheric disorders in this study have been found to be more sensitive to diffuse cognitive impairment (Albert & Heaton, 1988).

Despite the various hypotheses put forth concerning elderly Verbal-Performance discrepancies on the WAIS, it has been difficult to interpret what these differences truly mean. A major reason for this difficulty is that the WAIS is a multifactorial instrument. That is, subtests typically

require more than one mental ability (Albert & Heaton, 1988). It is therefore difficult to discern which mental ability is the cause for impairment on a particular subtest.

More recent attempts to elucidate the nature of cognitive functioning in older adults have focused primarily upon more circumscribed cognitive domains, such as attention, language, memory, visuospatial ability, and abstraction/set maintenance (Albert, 1988b; Albert & Heaton, 1988). A review of the literature concerning normal aging will now be undertaken.

Attention. Studies that have investigated attentional abilities have often focused on one of at least three interrelated subtypes, sustained attention, selective attention, and attentional capacity (Albert, 1988b).

Sustained attention is synonymous with vigilance and it refers to one's ability to focus on a task until completion (Albert, 1988b). The most commonly employed test used to measure this type of attentional ability is the Digit Span forward subtest from the WAIS, which requires an individual to repeat series of numbers that are of increasing length (Albert, 1988b; Wechsler, 1955). Results of various studies would suggest that this ability remains relatively intact over time (Albert, 1988a; Botwinick, 1978; Botwinick, Storandt, & Berg, 1986; Corkin, 1982; Wechsler, 1981). Another but less frequently used method to assess sustained attention is the Cross Off Test, which requires an

individual to cross off every occurrence of some letters or sequence of letters in a long string of letters (Albert, 1988b). In her review of the literature, Albert (1988b) found that this ability also remains well preserved in the elderly, but other researchers have noted a decline over time (Botwinick et al., 1986).

Selective attention is typically assessed by tasks that require individuals to attend to relevant stimuli and to ignore unimportant details (Albert, 1988b). For instance, an individual might be required to identify a geometric figure that is embedded within a drawing of meaningless geometric forms (Albert, 1988b; Capitani, Della Sala, Lucchelli, Soave, & Spinnler, 1988). Research findings within this area have been mixed, with some investigators finding that the elderly do have problems with selective attention (Botwinick et al., 1986; Capitani et al., 1988; Rabbitt, 1965), while other investigators have not found this decrement (Nebes & Madden, 1983; Nissen & Corkin, 1985). Albert (1988b) suggested that perceptual difficulties rather than attentional problems may have produced decrements within this area.

The last area of attentional ability to be reviewed is attentional capacity, which refers to one's total attentional resources (Albert, 1988b). The most frequently chosen method to assess this area of functioning has been via the use of the dual-task procedures, such as dichotic

listening (Albert, 1988b; Craik, 1977). This process requires an individual to perform two tasks simultaneously, such as to listen to multiple broadcasts through ear phones, with each ear receiving a different broadcast (Albert, 1988b). The subject is then required to report what he/she heard in each ear. Generally, research findings within this area have been mixed, with no definitive conclusion being reached about possible decrements (Albert, 1988b; Craik, 1977).

Trail Making Test

As noted previously, performance on the Trail Making Test relies heavily upon motor speed and attentional abilities (Lezak, 1983). It has frequently been used in gerontological research. Although findings have been mixed, the majority of studies would suggest an age related decline in test performance (Bornstein, Paniak, & O'Brien, 1987; Davies, 1968; Ernst, 1987; Kennedy, 1981). However, a small number of investigators have found no significant relationship between test performance and normal aging (Boll & Reitan, 1973).

Stroop Color and Word Test

Another test that requires attentional abilities is the Stroop Color and Word Test. It too, has frequently been employed in gerontological studies. Age related decrements in test performance have often been found (Cohn, Dustman, & Bradford, 1984; Golden, 1978).

Language. According to Albert (1988b), language ability can be subdivided into at least four areas: phonology, lexicon, syntax, and semantic knowledge.

Phonology refers to the appropriate use of language sounds (Albert, 1988b). A review of the literature suggests that the oral expression of sounds and words is relatively preserved in later life (Cummings, Benson, Hill, & Read, 1985; Faber-Langendoen, Morris, Knesevich, La Barge, Miller, & Berg, 1988; Goodglass & Kaplan, 1983), although some investigators (Cummings et al., 1985) included a heterogeneous age group in their sample and thus confounded results.

The term lexicon can be subdivided into lexical ability (i.e., knowing the name of a word) and its semantic representation (i.e., knowing the meaning of the word; Albert, 1988b). On measures of lexical ability, individuals are typically presented with a pair of words, one a nonsense word and the other real (Albert, 1988b). The object is to identify the real word. Research tends to support the notion that this ability is relatively unchanged over time (Albert, 1988b).

Semantic representation is frequently assessed via testing one's vocabulary (Botwinick, 1978). Investigators have typically noted that this ability remains relatively preserved within the elderly (Albert & Heaton, 1988; Botwinick, 1978; Wechsler, 1955).

Syntactic skill refers to one's ability to combine words in a meaningful way (Albert, 1988b). Research studies that were completed using a test of comprehension displayed mixed results. For example, a majority of studies have evidenced no decline in this ability with age (Goodglass & Kaplan, 1983; Orgass & Poeck, 1966; Swisher & Sarno, 1969). However, other investigators have noted a moderate effect for age (Hartje, Kerschensteiner, Poeck, & Orgass, 1973).

Boston Naming Test

Finally, semantic knowledge has often been assessed via tests of word retrieval (Albert, 1988b). A large number of gerontological studies completed within this area employed the Boston Naming Test (Albert, Heller, & Milberg, 1988; Borod, Goodglass, & Kaplan, 1980; La Barge, Edwards, & Knesevich, 1986; Nicholas, Obler, Albert, & Goodglass, 1985; Van Gorp, Satz, Kiersch, & Henry, 1986). It would appear that one's ability to name a series of pictorial objects remains fairly constant throughout adulthood until an individual reaches his/her 70s. At that point, there is a significant decline (Albert et al., 1988).

The Token Test

This test of language comprehension has frequently been employed in geriatric research (Corkin, 1982; Swihart, Panisset, Becker, Beyer, & Boller, 1989; Swisher & Sarno, 1969). However, reports of age effects for this test have been inconsistent (Lezak, 1983).

Memory. Many recent studies on memory functioning in the elderly have typically focused on one or more memory subtypes which include: sensory memory, primary memory, secondary memory, and tertiary memory (Albert, 1988b; Kaszniak et al., 1986).

Sensory memory lasts for a second or so and then decays (Botwinick, 1978). It can be divided into two subtypes: iconic memory which relies on one's visual system, and echoic memory, which employs the auditory system (Kaszniak et al., 1986). There have been relatively few studies on sensory memory in the elderly (Botwinick, 1978), and most of the current literature within this area is derived from studies on iconic memory (Kaszniak et al., 1986). Frequently, this type of memory is assessed via tachistoscopic presentation of rows of letters and/or numbers that last for less than one second (Botwinick, 1978). The subject is then required to identify a particular row of letters or numbers. Research suggests that there is a decline in sensory memory with age although it tends to be rather small and insignificant (Albert, 1988b; Botwinick, 1978; Kaszniak et al., 1986).

According to Botwinick (1978), primary memory is a "relatively temporary memory of what has just occurred...it is almost a read out of what was just experienced..." (p. 321). Primary memory is frequently assessed by presenting an individual with a string of digits (e.g.,

Digit Span subtest from the WAIS or the WAIS-R), letters, or words and requiring that person to recall and/or recognize items from that same list (Botwinick, 1978). Studies that have focused on primary memory have found little if any decline in this ability among the aged (Albert, 1988b; Botwinick, 1978; Botwinick et al., 1986; Corkin, 1982; Wechsler, 1955, 1981).

In contrast to the slight changes noted for sensory and primary memory, significant decrements in secondary memory (the ability to retain new information over a relatively long period of time, such as 30 minutes) have been found which frequently begin at about age 50 (Albert, 1988b; Kaszniak et al., 1986). Secondary memory is often measured by having individuals recall pairs of words on the Wechsler Memory Scale-Revised (WMS-R; Wechsler, 1987), details from stories (also on the WMS-R), and lists of words (usually from the CVLT; Delis et al., 1987) over periods of time (i.e., 20 to 30 minutes). Numerous studies have clearly documented an age related decline in the recall of this type of information (Albert, 1988b; Bleecker, Bolla-Wilson, Agnew, & Meyers, 1988; Botwinick, 1978; Craik & McDowd, 1987; Craik, Swanson, & Byrd, 1987; Kaszniak et al., 1986; Wechsler, 1987).

Tertiary or long term memory usually refers to one's ability to recall events that have happened years ago (Botwinick, 1978; Kaszniak et al., 1986). Assessment of

this type of memory functioning typically employs the use of a questionnaire (Kaszniak et al., 1986) which focuses upon past personal and historical events. Although relatively few systematic studies have been completed in this area (Botwinick, 1978), limited research findings suggest that this ability remains intact throughout one's life span (Howes & Katz, 1988; Wilson, Kaszniak, & Fox, 1981).

California Verbal Learning Test

The CVLT is a test of verbal secondary memory. Although it is a relatively new test, it has been used in geriatric research (Delis, Kramer, Freeland, & Kaplan, 1988; Delis et al., 1987; Mattson, Libon, Intreri, & Socha, 1991). Delis et al. (1987) found a significant linear relationship to exist between age and test scores on at least 10 of the variables on the CVLT; there was a decrement in test performance noted for elderly subjects.

Biber Figure Learning Test

The BFLT is a test of visual secondary memory. It is also a newly developed assessment instrument. Consequently, few studies have addressed the issue of age related effects on test performance. However, Glosser et al. (1989) reported that there was a significant decrement in test scores attributable to age.

Visuospatial Ability. Visuospatial functioning refers to one's ability to produce and/or recognize two or three dimensional shapes and forms (Albert, 1988b). Methods

frequently used to measure this ability have included paper and pencil drawings, visual recognition/matching tasks, and constructional tasks that have employed blocks, sticks, or puzzles (Albert, 1988b).

The Block Design and Object Assembly subtests from the WAIS and WAIS-R (Wechsler, 1955, 1981) have been among the most commonly used means for assessing this ability (Albert, 1988b). Researchers have noted the presence of significant age related decrements on these subtests by individuals who are in their 60s (Albert, 1988b; Albert & Heaton, 1988; Botwinick, 1978; Lezak, 1983; Wechsler, 1955, 1981).

In addition, a significant age related decline has been noted on visual matching and reconstruction tasks (Benton, Eslinger, & Damasio, 1981; Eslinger & Benton, 1983; Tamkin & Jacobsen, 1984) such as the Judgment of Line Orientation test (Benton et al., 1978) and the Hooper Visual Organizational Test (Tamkin & Jacobsen, 1984).

Finally, the quality of paper and pencil drawings of three-dimensional cubes produced by elderly subjects was noted to be significantly less accurate than that of younger counterparts (Albert, 1988b).

Block Design

The Block Design subtest is a popular measure of visuospatial/visuoconstruction functioning. It has been frequently employed in geriatric research (Eppinger, Craig, Adams, & Parsons, 1987; Glosser et al., 1988; Glosser et

al., 1989; Libon & Goldberg, 1990; Margolis, Taylor, & Greenlief, 1986). An examination of the norms would suggest that there are age related decrements in Block Design subtest performance (Wechsler, 1981).

Judgment of Line Orientation

This test is also a measure of visuospatial functioning. It too, has been employed in gerontological studies. Research findings would suggest that test performance does not significantly decline with normal aging (Benton et al., 1982; Libon & Goldberg, 1990).

Abstraction and Set Maintenance. Abstraction, or concept formation, refers to one's ability to perceive commonalities among words, objects or ideas (Matarazzo, 1972). Tests frequently employed to assess this ability include the Similarities subtests from the WAIS and WAIS-R (Wechsler, 1955, 1981; Albert, 1988b) and the Category Test (Albert, 1988b; Berg et al., 1987). Investigators have typically found that abstraction ability significantly declines with age (Albert & Heaton, 1988; Botwinick, 1978; Donnelly et al., 1980; Ernst, 1987; Heaton, Grant, & Matthews, 1986; Lezak, 1983; Wechsler, 1981), especially for those individuals who are in their 70s (Albert, 1988b).

Set maintenance is frequently associated with mental flexibility, or one's ability to sort and shift set (Albert, 1988a). Tests often used to measure this ability include the Trail Making Test (Reitan, 1955, 1958), Wisconsin Card

Sort Test (Berg et al., 1987) and Stroop Color and Word Test (Golden, 1978). By far, the majority of investigators within this area have found significant age effects (Bornstein et al., 1987; Cohn et al., 1984; Davies, 1968; Ernst, 1987; Golden, 1978; Goul & Brown, 1970; Haaland, Vranes, Goodwin, & Garry, 1987; Hart et al., 1988; Kennedy, 1981), especially when individuals reach their 70s (Albert, 1988b). However, some investigators (Boll & Reitan, 1973) did not find age to be a factor.

Summary

Physiological changes that occur during the course of normal aging typically begin in the person's late 20s or early 30s (Albert, 1988a). Great variability in physical changes has been noted and can include one's appearance, cardiovascular, respiratory, sensory, perceptual, motor, gastrointestinal, excretory, and endocrine systems (Albert, 1988a; Zarit & Zarit, 1987).

Methodological problems commonly encountered in studies on aging have included subject variables. The use of cross sectional and longitudinal designs have been found to maximize and minimize age related differences respectively (Albert 1988a; Benton & Sivan, 1984; Botwinick, 1978; Kaszniak et al., 1986).

Finally, studies on cognitive functioning in the normal elderly have been mixed, with few firm conclusions being drawn. However, most areas of language and memory

functioning are thought to remain relatively intact over time. Secondary memory and visual spatial ability are believed to decline with increasing age.

Hypotheses

The purpose of this study is basically two fold: 1) to help clarify the nature of cognitive deficits that may appear in depressed nondemented elderly, and 2) to determine whether or not Hasher and Zacks' (1979) "automatic and effort demanding" model can adequately account for whatever cognitive deficits that arise. Possible gender effects will also be examined.

The effect of depression on cognitive functioning will be investigated by forming two groups of subjects: nondemented elderly who are not depressed, and nondemented elderly who are suffering from Major Depression. A battery of neuropsychological tests that measure frontal lobe tasks, language functioning, visual spatial ability, verbal and visual memory will be administered to both groups. Specific tests within this battery are believed to be rather "effort demanding" while others are thought to require only "automatic" cognitive processes. Test results will be grouped according to their cognitive domain (either within the automatic or effortful classification) and then analyzed statistically, which is consistent with typical neuropsychological research (Luria, 1980). The following differences in test performance are expected to emerge from a sample of normal elderly as described above.

Hypothesis 1

It is proposed that depressives will perform more poorly on "effort demanding" cognitive tasks than normals because they require considerable sustained attention, concentration, effort, and motivation to complete (which are consistent with executive function tasks). These tests include the Trail Making Test (part B), Block Design subtest (timed condition), California Verbal Learning Test (immediate free recall condition-five trials), Biber Figure Learning Test (free recall learning condition-five trials), and Stroop Color and Word Test (color-word condition).

Hypothesis 2

It is proposed that depressed and nondepressed subjects will perform equally well on "automatic" cognitive tasks because they rely heavily upon overlearned skills and therefore require minimal attention, concentration, motivation, and effort (which are not consistent with executive function tasks). These tests include the Boston Naming Test, The Token Test, Judgment of Line Orientation test, Block Design subtest (untimed condition), California Verbal Learning Test (recognition condition), and the Biber Figure Learning Test (immediate and delayed recognition conditions).

II. METHOD

Participants

The final sample consisted of 50 (25 subjects in each group of depressed and depressed) elderly white subjects (39 females, 11 males). All males but one were members of the nondepressed group. Participants included residents of high rise congregate apartment complexes (22 subjects), nursing home residents (6 subjects), community dwellers (20 subjects) and inpatients in a geriatric psychiatric ward (2 subjects). All but 4 of the subjects were Jewish. In addition, approximately half of the participants were foreign born.

It is important to note that there were 9 subjects (6 females, 3 males) who were deleted from this study because they did not meet the initial diagnostic screening/classification measures required on the Blessed Test and/or on the DSM-III-R checklist for presence/absence of depression. Of this group, 5 subjects (4 females, 1 male) were referred to this experimenter with diagnoses of Major Depression. The remaining 4 subjects (2 females, 2 males) were originally classified as nondepressed by the referring sources.

It should also be noted that 28 potential subjects (22 females, 6 males) refused to participate in this study. Of this group, 10 subjects (7 females, 3 males) were referred

to this experimenter as nondepressed. The remaining 18 potential subjects (15 females, 3 males) were referred to this experimenter with diagnoses of Major Depression.

Classification Measures

The following psychological instruments were administered to the 50 participants in this study.

Blessed Information-Memory-Concentration Test

The cognitive functioning of all subjects in this study was assessed via Fuld's (1978) modification of the Blessed Information-Memory-Concentration Test (Blessed, Tomlinson, & Roth, 1968). The original test was validated post mortem, with a significant correlation of -0.591 found between the number of senile plaques counted in the brains of elderly demented individuals and their preterminal test scores (Blessed et al., 1968).

Fuld's (1978) version of this test has been extensively used in geriatric research (Parmelee et al., 1989; Parmelee, Kleban, & Lawton, 1990; Thal, Grundman, & Golden, 1986). It includes 26 items that measure such cognitive abilities as orientation to time, place and person, short term memory, long term memory, and concentration. Scores can range from 0 (no errors) to -33, with lower scores indicative of greater cognitive impairment (Fuld, 1978). Test-retest reliability of Fuld's version yields a correlation coefficient of 0.96 (Fuld, 1978).

Geriatric Depression Scale

The Geriatric Depression Scale (GDS; Yesavage et al., 1983) was used to screen the level of depression in all participants in this study. The GDS consists of 30 questions which require a yes or no response that measure affective symptoms of depression (Yesavage et al., 1983). The questions were presented orally to each subject.

The GDS has been used extensively in geriatric research (Dunn & Sacco, 1988; Lesher, 1986; Parmelee et al., 1989; Yesavage, 1986). A study of its psychometric properties has revealed an adequate internal consistency with an alpha coefficient of 0.94 (Yesavage et al., 1983). In addition, split-half and test-retest reliability coefficients were 0.94 and 0.85 respectively (Yesavage et al., 1983). The validity of the GDS is rather good; it was clearly able to discriminate among nondepressed, mildly depressed and severely depressed groups (Yesavage et al., 1983).

DSM-III-R Checklist

As a follow up to the GDS, each subject was administered a checklist based upon depressive criteria from the DSM-III-R (APA, 1987). Depressed subjects were administered a checklist for Major Depression in order to verify their current emotional state. Depressed individuals not meeting the diagnostic criteria for Major Depression (unipolar type) were eliminated from this study.

Nondepressed subjects were administered a checklist for Dysthymia, again in order to verify their current emotional functioning. Those subjects who met the criteria for Dysthymia (or for a more significant depressive disorder) were eliminated from the study.

Test Battery

Trail Making Test

The Trail Making Test has frequently been used as a measure of visual-conceptual and visuomotor tracking (Berg et al., 1987; Lezak, 1983). Subjects are required to draw lines from one numbered and/or lettered circle to another in a consecutive manner. Individuals are required to work as quickly as they can without lifting the pencil from the paper. Errors are noted and recorded by the examiner and pointed out to the subject for correction. Scoring is based upon time needed to complete each part (Reitan & Wolfson, 1985).

Reliability of parts A and B, as measured by the coefficient of concordance (Winer, 1971, p. 303) was noted to be .78 and .67 respectively (cited in Lezak, 1983). The validity of this test has been well established as an indicator of brain damage (Reitan, 1955, 1958; Sterne, 1973).

Judgment of Line Orientation

The Judgment of Line Orientation assesses one's ability to discriminate the direction or angulation of lines. Five practice items precede the 30 test items. An individual is required to match different pairs of shortened angled lines to full length angled pairs of lines that appear within a group of 11 angled lines (Benton et al., 1978, 1983; Eslinger & Benton, 1983).

A study of its psychometric properties revealed a corrected split-half reliability coefficient of 0.90 (Benton et al., 1978, 1983). One study compared the performance of patients with unilateral brain disease (i.e., strokes, tumors, etc.) on the Judgment of Line Orientation with tachistoscopic presentations of angled lines (which was found to be a highly sensitive measure of visuoperceptive efficiency). The correlation coefficient between these two test scores was 0.88 (Benton et al., 1978). Thus, this finding may be interpreted as suggesting that the Judgment of Line Orientation is of adequate validity as an indicator of visuospatial deficits.

Biber Figure Learning Test

Visual short term memory was assessed via the BFLT. This measure was designed to allow for the examination of different aspects of visual memory, including the rate and pattern of acquiring new information, differences between learning and retention, discrimination between short and

long term memory, and differentiation between visual memory impairments and other cognitive deficits (Glosser et al., 1989).

The BFLT consists of 10 moderately complex geometric designs that appear one per page in a spiral bound booklet. The administration of the BFLT consists of six assessment conditions, which require an individual to reproduce these geometric designs via paper and pencil under immediate and delayed recall conditions. During immediate recall conditions, test stimuli are typically presented one at a time for 3 seconds each. However, in this experiment, each design will be presented for 5 seconds each, in order to minimize age related deficits that may be modulated by fast presentation rates (Craik & Rabinowitz, 1985). Immediate and delayed recognition conditions (using a multiple choice format) follow each recall condition.

Test re-test reliability for the total free recall, delayed recall, recognition, immediate reproduction, and copy conditions was noted to have significant Pearson product-moment correlation coefficients of 0.88, 0.91, 0.82, 0.79, and 0.82 respectively. Validity of this test appears to be adequate as it has demonstrated ability to discriminate between differentially cognitively impaired groups (Glosser et al., 1989).

Boston Naming Test

The Boston Naming Test is a confrontation naming vocabulary test that consists of 60 pen and ink drawings of objects that are ordered from easiest (i.e., bed) to most difficult (i.e., abacus) which appear in a spiral bound booklet (Goodglass & Kaplan, 1983). The subject is required to name a pictorial object within 20 seconds of its initial presentation. A stimulus cue is provided only if the person misperceives the object or does not know what it is, (e.g., For number 25, which is a picture of a dart, the examiner would say "you throw it."). However, if the person is still unable to provide the correct response after an additional 20 seconds, a phonemic cue is provided (e.g., For the dart example, the examiner would say "it begins with the sound "da."). Testing is discontinued after six consecutive failures.

A large number of studies that have employed the Boston Naming Test have demonstrated good ability to discriminate between normal aged subjects and those who are cognitively impaired (Faber-Langendoen et al., 1983; Huff, Becker, Belle, Nebes, Holland, & Boller, 1987; Knesevich, La Barge, & Edwards, 1986).

The Token Test

The Token Test assesses auditory language comprehension (Boller & Vignolo, 1966; De Renzi & Vignolo, 1962). It consists of 20 tokens, half are circles and half are

squares. Tokens come in large and small sizes and appear in red, blue, green, yellow and white colors. Auditory commands presented by the examiner require the subject to touch, pick up or manipulate various combinations of tokens.

It is important to note that the validity of this test is well documented (Hartje et al., 1973; Orgass & Poeck, 1966).

The Stroop Color and Word Test

The Stroop Color and Word Test is a measure of verbal fluency, cognitive flexibility, and general cognitive efficiency (Berg et al., 1987; Golden, 1978; Lezak, 1983). Golden's (1978) version was the one employed in this experiment.

As noted previously, this test consists of three parts. Initially, a subject is required to read names of colors (red, green or blue) that appear in black ink. For the second part, a subject names the color of xxxx's which are printed in red, green, or blue ink. The final part requires the subject to name the color of the ink the color word is printed in, while ignoring the color word.

Golden (1978) reported that the test-retest reliability of this test is highly consistent across many of its versions. Reliabilities for subjects given both the individual and group versions of Golden's test have been reported to be 0.85, 0.81, and 0.69 (Golden, 1978). The validity of this test appears to be adequate as it has been

reported to be a sensitive instrument in detecting frontal lobe disorders and in discriminating brain injured individuals (Golden, 1978).

Block Design

The Block Design subtest is a measure of visuoconstruction functioning (Wechsler, 1981). It is particularly sensitive in discriminating individuals with visuospatial deficits and brain damage (Lezak, 1983). Depending on the level of complexity, four or nine red and white blocks are used by subjects to construct replicas of geometric designs that are originally presented in picture or block form. Subtest administration is terminated after three consecutive failures. In reviewing the Block Design's psychometric properties, Wechsler (1981) reported that the split half correlation of this subtest to be 0.87 across all age groups. Furthermore, test-retest reliability for ages 25-34 and 45-54 was noted to be 0.91 and 0.80 respectively (Wechsler, 1981). The Block Design subtest appears to have good validity as its content overlaps considerably with previously well studied and valid Wechsler scales (Wechsler, 1981).

California Verbal Learning Test

The CVLT is a relatively new instrument that assesses one's ability to learn verbal material, and it includes a measure of an individual's learning strategies, processes, and errors. It consists of 7 different parts. A subject is

required to recall lists of words under immediate and delayed conditions, with and without cues (Delis et al., 1987).

The 16 word version of the CVLT has a reliability coefficient of 0.92 for internal consistency for the first 5 immediate recall tasks. Also, the validity of the 16 word version CVLT has been clearly demonstrated (Delis et al., 1987, 1988). Psychometric properties of the 9 word version CVLT suggest that it is a valid assessment instrument of memory deficits in the elderly (Mattson et al., 1991).

Procedure

Subjects in this experiment were solicited from a high rise congregate apartment complex that provides meals and medical treatment, a nursing home, an inpatient geriatric psychiatric unit, and the community. All participants resided within the Philadelphia area. Permission to interview and test these subjects was sought via completion of a research application that was submitted to the Institutional Review Board (IRB) of each participating institution for consideration. Please refer to the Appendix.

Upon receiving permission to commence with this experiment, this investigator was provided with lists of individuals to form a pool of potential subjects. Each list contained the names of individuals who had previously been

screened by staff members from each institution to ensure that they were free of significant sensory impairments (i.e., vision, hearing, etc.), language/cognitive deficits (i.e., aphasia), and ill health that would interfere with participation in this study. In addition, several lists of potential subjects included only those individuals who were diagnosed as suffering from Major Depression but who were cognitively intact.

The remaining lists of subjects contained only those names of persons who were free of depression and who were also cognitively intact. Diagnostic classification of these subjects had been made previously by psychiatrists, psychologists, and/or mental health professionals within the past year at each facility. DSM-III-R criteria were used when making appropriate diagnoses.

Subjects were selected from each list and placed into the appropriate group, either to the cognitively intact/nondepressed group or to the cognitively intact/depressed group. Because of the difficulty locating subjects who met the appropriate screening classification criteria, all potential subjects were contacted and asked to participate in this study. Individuals on the lists who were willing to participate in this study were scheduled for an appointment for testing. At the time of testing, the experimenter read the informed consent to the subject and

that individual was asked to sign this form (depending on institutional policy).

All neuropsychological testing was completed individually. For those subjects who lived in the high rise apartment complexes or who were community residents, every effort was made to have the testing completed in the subject's home. For those individuals who lived in the nursing home, or who were inpatients at a psychiatric hospital, testing was completed in either the subject's room or in a Psychology Department examination room. Neuropsychological testing was completed within approximately 1 3/4 hours.

The initial phase of neuropsychological testing was to screen/classify the cognitive functioning of all subjects in this study. Each participant was verbally administered Fuld's (1978) version of the Blessed Information-Memory-Concentration Test. Those individuals who made less than 9 errors on this test were considered cognitively intact (Parmelee et al., 1990) and were at least temporarily retained for further participation in this study. Those individuals who made more than 8 errors were terminated from the study due to possible cognitive impairment (Fuld, 1978; Parmelee et al., 1989).

The second phase of neuropsychological testing was to assess/classify the level of depression in all participants who had so far been retained for this study. This process

consisted of administering a DSM-III-R checklist to each individual. Those persons who did not meet criteria for Dysthymia or for a more severe depression (based upon the DSM-III-R checklist) were included in the cognitively intact/nondepressed group. Those persons who met the DSM-III-R criteria for Major Depression (only unipolar type) were retained for the remainder of the study within the cognitively intact/depressed group. Both groups of subjects were administered the GDS.

Those individuals who met the screening criteria were retained for the remainder of the experiment, and were administered the entire neuropsychological test battery as described previously. The order of presentation of the test battery was as follows: the Boston Naming Test, free recall and immediate recognition tasks from the BFLT, the Trail Making Test, parts A and B, the Stroop Color and Word Test, delayed free recall and recognition, immediate reproduction and copy tasks from the BFLT, immediate recall tasks from the CVLT, the Block Design subtest from the WAIS-R, long delayed free recall, cued recall and recognition tasks from the CVLT, The Token Test (Part 5 only), and Judgment of Line Orientation (Form H).

This test sequence was formulated so that relatively easy tasks were administered early in the test session. Albert (1988b) believes that this process helps to reduce tension and to allow the subject to become acclimated to the

testing situation. Also, this test battery was arranged in such an order to accommodate the two 20 minute delay periods required during the administration of the CVLT and the BFLT (Delis et al., 1987; Glosser et al., 1989). Additional testing that was not similar in content to the memory tasks was undertaken during the 20 minute delay periods so as not to interfere with learning (Delis et al., 1987). All of the above tests were scored according to the instruction manuals produced by the original authors (see above citations) except the Block Design. For example, a success or failure was recorded according to the manual's instructions. However, in the event of failure, subjects were permitted to continue working on each design for up to four minutes. At that time, testing was discontinued and a success or failure was again noted.

Ethics

If, during the administration of the neuropsychological test battery, a participant became uncomfortable or distressed, appropriate measures would have been taken to remediate this situation. Corrective measures would have included termination of the testing session, offering reassurance about their test performance and/or providing counseling by staff members from the respective institution. However, significant untoward reactions by subjects did not occur.

Immediately following the completion of the test battery, each subject was given the opportunity to receive general feedback about their performance. If they desired such feedback, the experimenter described their performance in terms of "doing well" or "not as well" on the various tests. An emphasis was made to allow these subjects to feel good about their test performance and participation in this study.

Following the completion of this study, a brief summary was mailed to each participant which described important findings.

III. RESULTS

Demographics of the Final Sample

The final sample consisted of 50 elderly white subjects, including 11 males and 39 females. All male participants but one were members of the nondepressed group. The mean age of both groups combined was 80.54 years, (*SD* = 5.98). Ages ranged from 68 to 93 years. For the nondepressed group, the mean age was 81.1 years (*SD* = 4.35). The mean age for the depressed group was 79.9 years (*SD* = 7.30). The difference in mean ages between the two groups was not statistically significant.

The marital status of the sample included 2 subjects who were never married, 35 subjects who were widowed, and 13 subjects who were married. A chi-square analysis was performed in order to determine if the groups differed in the distribution of married and widowed elderly. Results of this analysis revealed nonsignificant findings, X^2 (1, *N* = 48) = 1.26, *p* = .261. Therefore, there was no significant relationship between mood and marital status.

Twenty-two subjects dwelled in a high rise congregate apartment complex. Six participants were residents in a nursing home. Twenty subjects were community residents and 2 participants were inpatients on a geriatric unit at a local psychiatric hospital. A chi-square analysis revealed

that the distribution of the type of residence for depressed and nondepressed groups was statistically significant, X^2 (2, N = 48) = 7.77, p = .021, when comparing high rise apartment complex, nursing home and community settings. For the depressed group, 32% of these subjects resided in a high rise apartment complex, 24% in a nursing home, 36% in the community, and 8% were inpatients at a local psychiatric hospital. For the nondepressed group, 56% of the subjects lived in a high rise apartment complex and 44% resided in the community.

The mean years of education for both groups combined was 12.2 (SD = 3.24). Participants' years of education ranged from 0 to 20. For the nondepressed group, the mean years of education was 12.80 (SD = 2.66). The mean years of education for the depressed group was 11.52 (SD = 3.67). The difference in mean years of education between the depressed and nondepressed groups was not statistically significant, t (48) = 1.41, p = .166.

Forty-eight of the subjects were right handed; none of the participants noted that he/she was left handed. However, 2 subjects stated that they used different hands/legs for various activities (e.g., writing, throwing, kicking a ball, etc.); they were classified as mixed dominant. A formal test for laterality was not administered.

With regard to the screening/classification measures, the overall mean score for both groups combined on the Blessed Information-Memory-Concentration Test was 2.92 (SD = 2.08). For the nondepressed group, the mean Blessed Information-Memory-Concentration Test score was 2.24 (SD = 1.59). The mean test score for the depressed group was 3.60 (SD = 2.31). The difference in mean Blessed Information-Memory-Concentration Test scores between the two groups was statistically significant, t (48) = 2.43, p = .020. Therefore, all analyses of group differences included Blessed test scores as a covariate.

Finally, the mean score on the GDS for the nondepressed group was 3.72 (SD = 2.78). For the depressed group, the mean GDS score was 19.16 (SD = 3.36). The difference between mean GDS scores for the two groups was statistically significant, t (48) = 17.70, $p < .001$.

Tests of Hypotheses

Not unlike standard practice in neuropsychological assessment, tests were grouped together according to cognitive domain (e.g., area of cognitive functioning that was assessed). Then statistical analysis was completed for each cognitive domain.

Hypothesis 1

It was hypothesized that depressed subjects would perform more poorly on "effort demanding" cognitive tasks

than nondepressed subjects. Effortful tasks were identified as the Trail Making Test (part B), Block Design subtest (timed condition), California Verbal Learning Test (immediate free recall condition-five trials), Biber Figure Learning Test (free recall learning condition-five trials), and Stroop Color and Word Test (color-word condition).

Multivariate analysis of variance revealed a nonsignificant difference in performance between depressed and nondepressed groups on the Stroop Color and Word Test (color-word condition) and Trail Making Test (part B), F (2, 46) = .33, p = .721).

Results for the repeated measures of analysis of variance for the CVLT revealed no significant main effect for mood, F (1,47) = 1.95, p= .17. That is, the mean number of items recalled across trials was not significantly different between groups. However, a significant main effect for learning across groups was observed, F (4,47) = 54.22, $p < .001$. In other words, significant learning took place over trials for both groups. More importantly, however, there was a significant interaction, F (4,47) = 3.39, p = .01, between mood and learning over trials. It would appear that depressed subjects initially learned less than nondepressed subjects. However, over several trials, depressed subjects' performance eventually caught up to nondepressed subjects. Table 1 summarizes the means for CVLT learning trials.

Results were somewhat different for the repeated measures of analysis of variance for the BFLT. A significant main effect for mood was observed, F (1,47) = 5.61, p =.02. That is, the mean number of objects recalled across learning trials was significantly better for nondepressed subjects than for depressed ones. In addition, a significant main effect for learning trials was observed, F (4,47) = 73.75, p < .001. In other words, all subjects tended to learn over the course of trials. The interaction between learning over trials and mood was not significant, F (4,47) = 3.5, p = .85. Therefore, the rate of learning did not depend on mood. Table 2 summarizes the means for the five learning trials of the BFLT.

The last multivariate analysis of variance to be completed within the effortful domain revealed a significant difference, F (1,47) = 4.31, p = .043, between depressed and nondepressed groups on the Block Design subtest (timed condition). Nondepressed subjects tended to perform significantly better than depressed subjects. Table 3 summarizes the group size, means and standard deviation for the Block Design subtest.

Table 1

Means for the Five Learning Trials for the CVLT

Trial	Nondepressed Group	Depressed Group
1	5.84	4.99
2	7.20	6.15
3	7.44	6.99
4	7.64	7.71
5	7.68	7.51

Table 2

Means for the Five Learning Trials for the BFLT

Trial	Nondepressed Group	Depressed Group
1	8.99	5.29
2	12.23	8.97
3	14.03	11.13
4	16.51	12.65
5	17.55	13.53

Table 3

Group Size, Means and (Standard Deviation) for Block Design Subtest (Timed)

Group	N	Mean	Standard Deviation
Nondepressed	25	17.32	7.74
Depressed	25	12.96	5.76

Hypothesis 2

It was hypothesized that depressed and nondepressed subjects would perform equally well on "automatic" cognitive tasks. These tasks were identified as the Boston Naming Test, The Token Test, Judgment of Line Orientation, Block Design subtest (untimed condition), California Verbal Learning Test (recognition condition), and Biber Figure Learning Test (immediate and delayed recognition conditions).

Multivariate analysis of variance revealed no significant differences between depressed and nondepressed subjects on the Boston Naming Test and The Token Test, F (3,45) = .21, p = .889.

Similar results were found for a multivariate analysis of variance which revealed nonsignificant differences between depressed and nondepressed subjects on the CVLT (recognition condition) and BFLT (immediate and delayed recognition conditions), F (3,45) = 1.11, p = .354.

The results of an analysis of variance revealed no significant differences between depressed and nondepressed groups on Judgment of Line Orientation test performance, F (1,47) = 1.11, p = .297.

Finally, the results of another analysis of variance revealed a nonsignificant relationship between depressed and nondepressed subjects on Block Design subtest (untimed condition) performance, F (1,47) = 2.30, p = .136.

Additional Analyses

Medication and Cognitive Functioning

Five one-way analyses of variance tests were performed in order to determine if type of medications used by subjects was related to cognitive functioning as measured by Blessed Information-Memory-Concentration Test scores. Five families of medications were examined with regard to Blessed test scores; they included antidepressant, antianxiety, cardiovascular, thyroid, and diabetic medications.

Univariate analysis of variance revealed that Blessed test scores were not significantly different between groups of subjects taking and not taking antidepressant medication, F (1,44) = .34, p = .565.

Similar results were noted when using univariate analysis of variance to discriminate between groups of subjects taking and not taking antianxiety medication. Blessed test scores were not significantly different between these two groups, F (1,44) = .54, p = .467.

However, when comparing Blessed test scores between groups of subjects taking and not taking cardiovascular medication, univariate analysis of variance test results approached significance, F (1,44) = 3.41, p = .072. The mean Blessed test score for the group of subjects taking cardiovascular medication was 3.31 (SD = 2.24). The mean Blessed test score for the noncardiovascular medication group was 2.07 (SD = 1.73).

Univariate analysis of variance revealed no significant difference between groups of subjects taking and not taking thyroid medication on Blessed test scores, $\underline{F}$ (1,44) = .66, $\underline{p}$ = .420.

Finally, when comparing Blessed test scores of groups of subjects taking and not taking diabetic medication, univariate analysis of variance approached significance, $\underline{F}$ (1,44) = 3.27, $\underline{p}$ = .078. However, it should be noted that only 4 subjects out of the entire sample took diabetic medication.

Medication and Mood

Five chi-square analyses were performed to determine if the distribution of medications was the same or different for depressed and nondepressed groups. The types of medications of interest included antidepressant, antianxiety, cardiovascular, thyroid, and diabetic.

A chi-square analysis revealed a significant difference between depressed and nondepressed groups for the distribution of antidepressant medication, X^2 (1,$\underline{N}$ = 46) = 5.1, $\underline{p}$ = .024. Subjects who were depressed were more likely to be taking antidepressant medications.

Similar significant results were noted for a chi-square analysis when comparing the distribution of antianxiety medication for depressed and nondepressed groups, X^2 (1,$\underline{N}$ = 46) = 5.1, $\underline{p}$ = .024. Depressed participants were also more likely to be taking antianxiety medication.

However, nonsignificant findings were evident for a chi-square analysis comparing the distribution of cardiovascular medication for depressed and nondepressed groups, X^2 (1,N = 46) = .33, p = .566. No significant relationship between mood and cardiovascular medication was found.

Nonsignificant results were found for a chi-square analysis when comparing the distribution of diabetic medication for depressed and nondepressed groups, X^2 (1,N = 46) = .11, p = .732. These findings suggest that there was no significant relationship between mood and diabetic medication.

Finally, nonsignificant results were also found for a chi-square analysis when comparing the distribution of thyroid medication for depressed and nondepressed groups, X^2 (1,N = 46) = .01, p = .905. No significant relationship between thyroid medication and mood was found.

Gender Effects

Because there was only one male participant in the depressed group, gender effects were not examined.

IV. DISCUSSION

The purpose of this study was two fold: 1) to help clarify the nature of cognitive deficits that may appear in depressed nondemented elderly, and 2) to determine whether or not Hasher and Zacks' (1979) "automatic and effort demanding" model can adequately account for whatever cognitive deficits that arise. Two specific hypotheses were proposed: 1) individuals that were depressed would perform more poorly than nondepressed subjects on tasks that were considered effortful, and 2) there would be no differences between depressed and nondepressed groups on automatic tasks.

The analysis of the data largely supported these hypotheses. Depressed subjects performed significantly worse on most effortful tasks than nondepressed subjects. These findings were apparent for the Block Design subtest (timed condition) and the BFLT (free recall learning condition-five trials). Initially, depressed subjects also performed significantly worse on the CVLT (immediate free recall condition-five trials) than nondepressed subjects. However, as the number of learning trials increased, the difference in performance between the two groups on the CVLT was no longer significant. The only unexpected finding was that depressed subjects did not perform significantly worse

on the Trail Making Test (part B) and the Stroop Color and Word Test (color-word condition) than nondepressed subjects.

As predicted, there were no significant differences in performance between depressed and nondepressed groups on automatic tasks. These tasks included the Block Design subtest (untimed condition), CVLT and BFLT recognition conditions, Boston Naming Test, The Token Test, and Judgment of Line Orientation. Gender effects were not examined because there was only one male in the depressed group.

The above mentioned findings provide considerable support for Hasher and Zacks (1979) "automatic and effortful" model. These results are also consistent with the findings of Cohen et al. (1982), Weingartner (1986), and Weingartner et al. (1981). As noted previously, Hasher and Zacks described automatic tasks as being unaffected by depression. Similar results were found in this current study; there were no significant differences in performance between depressed and nondepressed groups on automatic tasks. These investigators further stated that performance on effortful tasks was vulnerable to depression. Also, performance on effortful tasks was reported to benefit from practice. For the most part, results in this current study were consistent with the effortful paradigm. Initially, depressed subjects performed significantly worse on the Block Design subtest (timed condition). However, with additional practice (Block Design subtest-untimed

condition), depressed subjects' performance was no longer significantly different from the nondepressed subjects. Similar findings were apparent for the CVLT (immediate free recall learning condition). Initially, depressed subjects performed more poorly on early learning trials of this test. However, with practice over five learning trials, the difference in performance between the two groups on the CVLT was no longer significant. On the BFLT, significant differences in performance between the two groups remained across the five learning trials. However, if additional learning trials were provided for this effortful task, significant differences between the two groups might have disappeared.

Possible explanations for the results found in this study must include consideration of the sampling characteristics, conceptual models, and methodological techniques employed in this study.

Sample Characteristics

It is possible that the particular characteristics of the sample employed in this study helped to obfuscate potential significant differences between depressed and nondepressed subjects on test performance (e.g., Trail Making Test, part B, and Stroop Color and Word Test, color-word condition).

Although 50 subjects were employed in this study, an additional 28 potential subjects refused to participate. Of this latter group, 18 potential subjects were referred to this experimenter as suffering from Major Depression. The remaining 10 subjects were classified as nondepressed by their referring sources. One must consider that possible differences in sampling characteristics may have existed between those individuals who participated in this study and those who did not. Specifically, possible differences in attention, effort and motivation might have affected test performance.

Another sample characteristic which may have affected test performance was the composition of the group. It was noted that 46 of the 50 group members in this study were of the Jewish faith, with approximately one half of them being foreign born. Of those who were foreign born, most individuals were originally from Central and Eastern Europe, although one participant was from North Africa. Many of the subjects were at least bilingual. Therefore, it is likely that these subjects were not representative of the standardization groups used to develop norms for tests used in this experiment. Consequently, sociocultural factors may have mitigated against potential differences in test performance between depressed and nondepressed groups.

Another potential problem was the composition of the depressed sample. Only 2 of the 25 depressed subjects were

inpatients at a psychiatric hospital. The remaining 23 depressed subjects were residents of either a nursing home, high rise congregate apartment complex or the community. In view of these findings, it is important to note Rohling and Scogin's (1993) observation that most researchers who had found significant differences between depressed and nondepressed subjects on tests of cognitive functioning typically employed severely depressed inpatients as subjects. Although this writer made every effort to ensure the proper diagnosis of Major Depression, perhaps this depressed group was not severely enough depressed to elicit significant differences in certain areas of test performance (e.g., Trail Making Test, part B, and Stroop Color and Word Test, color-word condition). It should be noted that all depressed subjects employed in this study met DSM-III-R criteria (APA, 1987) for Major Depression, but most were mild in intensity.

Furthermore, it is important to note that physical illness, including cardiovascular disorders can account for changes in cognitive functioning (Albert, 1988a; O'Brien, 1988). O'Brien (1988) pointed out that with increasing age comes increasing incidence of vascular disease "with and without dementia" (p. 79). He contended that the vascular contribution to cognitive impairment is currently underestimated. In fact, O'Brien noted that health care providers often acknowledge vascular involvement, but only

within the context of Multi-Infarct Dementia (APA, 1987), which is caused by a series of relatively large strokes. Little attention has been spent on studying the effects of small strokes and their location (O'Brien, 1988). Given the incidence of cardiovascular medication across groups in this study, it is possible that both groups included members with vascular involvement and minor cognitive impairment. This factor could have masked the effects of depression by lowering both groups' test scores.

Finally, medication is another factor that could have affected the cognitive and/or emotional functioning of the participants in this study (Albert, 1988a; Jenike, 1988; Ouslander, 1982). For example, de Leo and Diekstra (1990) noted that because drugs tend to remain longer in elderly subjects' systems, they are at greater risk for drug toxicity and/or untoward drug interactions (which can cause depression and cognitive impairment). However, there is limited agreement about the degree to which pharmacological treatment produces unfavorable side effects (de Leo & Diekstra, 1990) in the elderly, although it is thought to be substantial (Albert, 1988a). In this study, there was a relatively large number of subjects who were taking cardiovascular, antianxiety, antidepressants and thyroid medications. Clearly, medication is a confounding issue.

Conceptual Issues

Conceptual issues may have been responsible for clouding potential significant differences between depressed and nondepressed subjects on test performance. For example, there has been considerable debate among some researchers concerning the classification and operationalization of automatic and effort demanding tasks (Begg, Maxwell, Mitterer, & Harris, 1986; Greene, 1986; Naveh-Benjamin, 1987). Naveh-Benjamin (1987) raised the possibility that automatic and effortful tasks are not as distinct as originally thought. Rather, this latter author proposed that automatic and effortful tasks are linked on a "continuum" and whatever differences there are may only be "a matter of degrees" (p. 603). Furthermore, Naveh-Benjamin (1987) stated that certain cognitive processes may be a combination of both automatic and effortful cognitive tasks, which can make the interpretation of test results difficult. Finally, this author noted that the criteria Hasher and Zacks (1979) proposed for automatic tasks may be too vague. For instance, denoting "sensitivity" to stimuli when under incidental conditions makes predictions about subjects' performance difficult (Naveh-Benjamin, 1987).

Consequently, it is possible that several of the concerns about automatic and effort demanding tasks mentioned above are applicable to this study. These factors may have obscured possible significant test differences

between depressed and nondepressed groups. It would not be unreasonable to speculate that several effortful tasks employed in this study were not accurately defined. These tests may have been wrongly described as effortful. When, in fact, they were a combination of the two constructs.

Of special interest to this writer are a number of important findings about depression in the elderly that have been recently reported. For instance, depression in the elderly is often associated with an increased risk for mortality (de Leo & Diekstra, 1990). In addition, longitudinal studies have suggested that, for some groups of depressed elderly, depression is a risk factor for possible future cognitive impairment and/or dementia (Emery, 1988; Parmelee et al., 1990). Also, it is important to note that despite the paucity of studies concerning the prognosis for depression in the elderly, limited findings almost consistently report a poor outcome (de Leo & Diekstra, 1990).

The above mentioned findings might permit speculation that depression in the elderly is unlike depression in a younger population. If this proves to be the case, then redefining the term Major Depression should be attempted, including the creation of a new diagnostic category in order to address differences between young and elderly depressed groups.

Another conceptual issue to be discussed is what role, if any, psychosocial influences had on cognitive functioning. This possibly confounding, yet important factor was largely ignored by this experimenter. For example, the psychosocial factor of the living arrangement of the participants in this study was not fully addressed. This experimenter only noted whether the participants lived within the community, nursing home, congregate high rise apartment complex, or inpatient settings. Almost nothing else was done to detail the participants' income, number of family and friends, housing quality, and neighborhood. These are important factors which could have affected cognitive functioning (Lawton, 1986).

Methodological Issues

Methodological issues also need to be considered when interpreting the results of this experiment. For example, the test instruments employed in this study may have been a potential source of confounding. Although this topic was discussed previously, it was done within the context of whether the tests were accurately defined as tapping automatic or effortful processes. However, the current issue is whether or not the tests employed were appropriate for elderly subjects. For instance, visual problems encountered by the participants may have obscured possible differences between depressed and nondepressed groups. It

should be recalled that several automatic and effortful tasks were visually presented. Considerable variability in test scores was noted across these tasks, with some variability possibly being attributable to visual problems. For instance, a number of subjects complained of having difficulty perceiving small thin lines (on the Judgment of Line Orientation task), discriminating colors (particularly blues and greens on the Stroop Color and Word Test), and discerning letters from numbers (on the Trail Making Test, part B). Visual problems could have been responsible for an increase in response time and/or for an increase in the number of errors produced by the subjects. Such test results could have obscured true differences, if any, between depressed and nondepressed groups. Clearly, interpretation of test results should be made cautiously.

An additional methodological concern is the way in which diagnoses were made, particularly for the depressed subjects. As noted previously, it is not always easy to diagnose the presence of depression in the elderly (Jenike, 1988). This group has been known to mask depressive features (Blazer & Williams, 1980; Ouslander, 1982) and/or confound the diagnosis of depression with physical and medical complaints (Gallagher, 1986). In the current experiment, subjects suffering from Major Depression were diagnosed by a variety of mental health professionals across several institutions and agencies. DSM-III-R criteria were

required to make appropriate depressive diagnoses. Once referred to this experimenter, each participant was interviewed using a checklist employing DSM-III-R criteria to confirm or to disavow the Major Depression diagnosis. Administration of the GDS was also undertaken with all subjects.

However, these procedures may not have been adequate to ensure proper diagnosis for some of these individuals. For example, several of the DSM-III-R criteria used in making a diagnosis of Major Depression are based upon self-reports and/or observations by others (APA, 1987). Because elderly persons are often more resistant to psychiatric evaluations than younger patients (Wells, 1979), inaccurate data may have been provided to the referral sources, and in turn, passed on to this experimenter. In addition, since there were several referring mental health professionals involved, it is likely that their abilities and level of clinical experience varied considerably. Consequently, the diagnostic classification of some of the participants could be questioned.

One final methodological issue to be addressed is the use of the Blessed Information-Memory-Concentration Test. As noted previously, this screening measure has been widely used in geriatric research (Fuld, 1978). The original version of the test was validated post mortem, and was correlated with changes in the cerebral gray matter of

elderly patients (Blessed et al., 1968). The revised version, which was employed in this experiment, has also been widely used to detect cognitive impairment thought to arise from organic involvement (Fuld, 1978; Thal et al., 1986). Despite its extensive applications within the geriatric field, nothing has been published concerning possible effects of depression on Blessed test scores. Therefore, a question arises whether the significant difference in Blessed test scores between depressed and nondepressed subjects found in this study reflect the effects of depression, the effects of organicity, or a combination of both variables. If some or all of the difference in Blessed test scores is reflective of depression, then the statistical adjustment used to account for such differences was not warranted.

Theoretical Implications of Results

The results of this study may have important ramifications for elderly individuals and their health care providers. As noted previously, the effect of Major Depression on cognitive functioning within the elderly remains poorly understood (Caine, 1986; Kiloh, 1962; Weingartner et al., 1981; Wells, 1979). The importance of resolving this issue is best appreciated when health care workers are required to correctly differentiate between dementia, normal aging, and depression. Cognitive deficits

have often been associated with each of these conditions. The problem is exacerbated because dementia, normal aging, and depression may occur together and/or independently (Albert, 1981). An incorrect diagnosis could lead to inappropriate and catastrophic treatment for an unfortunate individual, such as placement in a nursing home, rather than receive treatment for depression at home.

The results of this study may help health care providers of elderly adults to correctly differentiate between dementia and depression. This process would hopefully lead to the implementation of appropriate treatment strategies for elderly patients. The results found in this study would suggest that depressed elderly subjects should perform as well as nondepressed elderly subjects on most psychological/neuropsychological test measures. The possible exception might be on the most effort demanding tasks. Therefore, if a depressed elderly patient demonstrated impairment on psychological/neuropsychological assessment instruments, that individual should be initially treated for depression. If, after the depression resolves, and cognitive deficits remain, then a more thorough medical workup for possible dementia should be undertaken.

Future Research

The relationship between depression and cognitive functioning in the elderly remains inconclusive. However, Hasher and Zacks' (1979) "automatic and effortful" model has shown promise as a means to identify possible cognitive deficits. In view of possible sampling, conceptual and methodological problems encountered in this study, recommendations will now be made in an attempt to address these issues and to provide direction for future research.

It is recommended that future studies (in this country) include only American born and educated subjects, unlike this experiment. Participants who do not meet these criteria are unlikely to resemble the original standardization group upon which norms are based. Consequently, this problem could lead to difficulty with test administration and scoring, which, in turn, could make test interpretation difficult (Anastasi, 1988).

In addition, it is advisable to use inpatients as subjects when studying the effects of depression on cognitive functioning. Rohling and Scogin (1993) noted that most researchers who found an effect for depression on cognitive functioning employed depressed inpatient subjects. Therefore, it appears that the severity of depression plays a key role in helping to detect the greatest possible differences between depressed and nondepressed groups.

Another recommendation would be to use a healthier group of subjects. As noted previously, various medical illness are often associated with changes in cognitive functioning (Ouslander, 1982). Therefore, use of a healthier group of subjects could reduce possible confounding.

In a related matter, it would also be helpful to be more accountable to health related issues, not just to screen out frail or elderly subjects. As noted by Lawton (1986), physical health and cognitive functioning are related in varying amounts, but the degree to which is not clear. A measure of physical health, such as the Cumulative Illness Rating Scale (see Kane & Kane, 1981) could be employed to study specific illnesses and their relationship, if any, to cognitive functioning.

Although expensive, the use of Computerized Tomography and/or Magnetic Resonance Imaging studies may also help to give us a better understanding of cognitive functioning, its relationship to depression, and as a sophisticated means of screening ill from healthy subjects (Albert & Stafford, 1988).

One more issue related to health is the subjects' use of medications. As reported earlier, Ouslander (1982) noted that there is an association between cognitive impairment and various types of medications frequently used by the

elderly. Test results could be more easily understood if subjects were free of psychopharmacological intervention.

In view of results found in this study, and in other investigations, it is recommended that Hasher and Zacks' (1979) automatic and effort demanding model be re-examined for possible conceptual problems (Begg et al., 1986; Greene, 1986; Naveh-Benjamin, 1987; Rohling & Scogin, 1993). It is necessary that automatic and effortful tasks be more specifically defined and operationalized. Perhaps greater interfacing of psychological and neuropsychological principles could help to achieve this goal.

Another recommendation is for researchers to study more fully the depressive symptoms found in the elderly. Unique psychological stressors, such as bereavement and retirement (de Leo & Diekstra, 1990; Lawton, 1986), and risk factors (i.e., depression) leading to dementia and/or mortality (de Leo & Diekstra, 1990; Emery, 1988) raise a question about whether or not depression in the elderly is the same as depression in a younger population. Perhaps a new diagnostic category is needed for the older group. Researchers who employ the Older Americans Research and Service Center Instrument (OARS; see Kane & Kane, 1981) may gain an increased awareness of this issue.

Test instrumentation is another area for improvement. Given the concern for accurately defining tasks as automatic and effortful, it would be desirable to employ other tests

(i.e., Word Fluency Test) that may be relatively more purely effortful (see Spreen & Strauss, 1991). In addition, the use of nonstandardized versions of tests (i.e., enlarged and photocopied) may help elderly subjects compensate for sensory deficits that frequently accompany normal aging (Albert, 1988a; Cummings & Benson, 1983; Zarit & Zarit, 1987). Pretesting of all psychological instruments to be used in future studies is advisable in order to determine their appropriateness for the intended sample.

Finally, the Blessed Information-Memory-Concentration Test and/or other screening instruments (i.e., Mini-Mental State Examination, see Folstein, Folstein, & McHugh, 1975) need to be examined for possible sensitivity to the effects of depression. Specifically, can depression cause decrements in Blessed test performance that is not related to organic involvement? If so, then statistical and methodological procedures should be employed to take this factor into account.

Hopefully, the findings and suggestions that appear in this experiment will help to guide future research endeavors in clarifying the relationship between depression and cognitive functioning in the elderly.

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APPENDIX

Blessed Information-Memory-Concentration Test

Geriatric Depression Scale

Informed Consent Forms

BLESSED TEST

Name _____

Age _____ Correct name, if wrong _____ (D.O.B.)

When born? _____
Month Year

Where born? _____ Say: Some Q's easy, some will be hard.

Name of this place _____

What street is it on? _____

How long are you here? _____

Name of this city? _____

Today's date? _____ (within a day)
Month _____
Year _____
Day of week _____
Part of day _____
Time? (best guess _____ (Time:) (within 1 hour)
Season? _____

Something to remember:

_____John _____ Brown _____ 42 _____ Market St. _____ Chicago

Mother's first name _____ (any sensible resp.)
How much schooling did you have? _____

Name of one specific school _____

What kind of work have you done? _____

Who is the president now? _____

Who was the last president? _____

Date of WW I (1914-18) _____
Date of WW II (1938-45 _____
Next 3 items: For uncorrected errors, score 2: for corrected errors, score 1.
Months of the year, backwards. Start with December....
D N O S A Jl Jn M Ap Mch F Ja

Count 1 - 20
Count 20 - 1. 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
Recall name & address ___ J ___ 3 ___ 42 ___ M ___ C
(Cue with "John Brown", only. Score up to 5 errors.
Total Blessed
Errors

GERIATRIC DEPRESSION SCALE

1. Are you basically satisfied with your life?..... yes / no
2. Have you dropped many of your activities and interests? yes / no
3. Do you feel that your life is empty? yes / no
4. Do you often get bored? yes / no
5. Are you hopeful about the future?..... yes / no
6. Are you bothered by thoughts you can't get out of your head? yes / no
7. Are you in good spirits most of the time? yes / no
8. Are you afraid that something bad is going to happen to you? yes / no
9. Do you feel happy most of the time? yes / no
10. Do you often feel helpless?..... yes / no
11. Do you often get restless and fidgety? yes / no
12. Do you prefer to stay at home, rather than going out and doing new things? yes / no
13. Do you frequently worry about the future? yes / no
14. Do you feel you have more problems with memory than most? yes / no
15. Do you think it is wonderful to be alive now?..... yes / no
16. Do you often feel downhearted and blue? yes / no
17. Do you feel pretty worthless the way you are now? yes / no
18. Do you worry a lot about the past? yes / no
19. Do you find life very exciting? yes / no
20. Is it hard for you to get started on new projects?..... yes / no
21. Do you feel full of energy? yes / no
22. Do you feel that your situation is hopeless? yes / no
23. Do you think that most people are better off than you are? yes / no
24. Do you frequently get upset over little things? yes / no
25. Do you frequntly feel like crying?..... yes / no
26. Do you have trouble concentrating? yes / no
27. Do you enjoy getting upin the morning? yes / no
28. Do you prefer to avoid social gatherings? yes / no
29. Is it easy for you to make decisions? yes / no
30. Is your mind as clear as it used to be? yes / no

Informed Consent

The Neuropsychology of Depression in the Elderly

Subject_____ID#_____

Age_____Marital Status_____Education_____Sex_____

Dear Participant:

Thank you for agreeing to participate in this research project. We are interested in learning about PGC residents' health and emotional well-being, with regard to how they think. To do this, we are talking with a number of residents about these things, as well as asking them to complete several questionnaires and tasks that measure your thoughts and feelings. This process should take approximately 1 3/4 hours. There is little if any risk involved in this study.

Although we hope the questions will interest you, the main purpose is to learn more about elderly individuals, rather than be of particular interest to you. Also, you will not be paid for participating in this study.

You should understand that your participation in this project is completely voluntary. If there are any questions that you don't want to answer, please say so. You can stop the interview or withdraw from the project at any time.

This project is confidential. Your answers to our questions are strictly for the purpose of this research, and they won't be repeated to anyone. If you have any questions about the study, your interviewer will be happy to explain. If you have any other questions or comments, please contact:

Jay Weissman,M.A./Project Principal Investigator ph# 455-6884
Deborah Frazer,Ph.D./Dept. Head, Clinical Psychology 455-6884

INFORMED CONSENT

Subject_____ID#_____Sex___Handedness_____

Age_____Marital Status____Education_____

Dear Participant:

Thank you for agreeing to participate in this research project. We are interested in learning about older adults' health and emotional well-being, with regard to how they think and feel. To do this, we are interviewing a number of patients, asking them to complete several questionnaires, paper and pencil, and motor tasks. In addition, you will be asked to recall words and pictures. This process should take approximately 1 3/4 to 2 hours. There is little if any risk involved in this study.

Although we hope the questions will interest you, the main purpose is to learn more about elderly individuals, rather than be of particular interest to you. However, your responses on these measures could provide your doctors at this hospital with additional information that could aid in your treatment.

Your answers to our questions are strictly confidential. They won't be shared with anyone other than the staff members who are treating you.

You should understand that your participation in this research project is completely voluntary. If there are any questions that you don't want to answer, please say so. You can stop the interview or withdraw from this project at any time, without penalty or loss of benefits to which you are otherwise entitled. Also, you will not be paid for participating in this study.

It is not the policy of the sponsor of this research project in which you are participating to compensate or provide medical treatment for human subjects in the event the research results in physical injury. Treatment for adverse reactions, untoward side effects or physical injuries as a result of this research will be provided under the same financial arrangements as for non-research related treatment. In the event that you believe you have suffered any physical injury as the result of participation in the research program, please contact the Risk Management Department of Pennsylvania Hospital at (215) 829-7750, who will review the matter with you, identify other resources that may be available to you, and provide further information as to how

to proceed.

If you have any questions about the study, your interviewer will be happy to explain. If you have any other questions or comments about this study or your rights, please contact:

Jay Weissman, M.A. Project Principal Investigator ph#356-3724
Peter Badgio, Ph.D. Director of Neuropsychology ph#471-2049

Signature_____Date_____

Witness_____Date_____