

INFORMATION TO USERS

This reproduction was made from a copy of a document sent to us for microfilming. While the most advanced technology has been used to photograph and reproduce this document, the quality of the reproduction is heavily dependent upon the quality of the material submitted.

The following explanation of techniques is provided to help clarify markings or notations which may appear on this reproduction.

1. The sign or "target" for pages apparently lacking from the document photographed is "Missing Page(s)". If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting through an image and duplicating adjacent pages to assure complete continuity.
2. When an image on the film is obliterated with a round black mark, it is an indication of either blurred copy because of movement during exposure, duplicate copy, or copyrighted materials that should not have been filmed. For blurred pages, a good image of the page can be found in the adjacent frame. If copyrighted materials were deleted, a target note will appear listing the pages in the adjacent frame.
3. When a map, drawing or chart, etc., is part of the material being photographed, a definite method of "sectioning" the material has been followed. It is customary to begin filming at the upper left hand corner of a large sheet and to continue from left to right in equal sections with small overlaps. If necessary, sectioning is continued again—beginning below the first row and continuing on until complete.
4. For illustrations that cannot be satisfactorily reproduced by xerographic means, photographic prints can be purchased at additional cost and inserted into your xerographic copy. These prints are available upon request from the Dissertations Customer Services Department.
5. Some pages in any document may have indistinct print. In all cases the best available copy has been filmed.

**University
Microfilms
International**
300 N. Zeeb Road
Ann Arbor, MI 48106



Order Number 1332536

**Qualitative aspects of memory performance in depressed versus
demented elderly**

Nussbaum, Paul David, M.A.

The University of Arizona, 1987

U·M·I
300 N. Zeeb Rd.
Ann Arbor, MI 48106



QUALITATIVE ASPECTS OF MEMORY PERFORMANCE
IN DEPRESSED VERSUS DEMENTED ELDERLY

by
Paul David Nussbaum

A Thesis Submitted to the Faculty of the
DEPARTMENT OF PSYCHOLOGY
In Partial Fulfillment of the Requirements
For the Degree of
MASTER OF ART
In the Graduate College
THE UNIVERSITY OF ARIZONA

1 9 8 7

STATEMENT BY AUTHOR

This thesis has been submitted in partial fulfillment of requirements for an advanced degree at the University of Arizona and is deposited in the University Library to be made available to borrowers under rules of the Library.

Brief quotations from this thesis are allowable without special permission, provided that accurate acknowledgement of source is made. Requests for permission for extended quotation from or reproduction of this manuscript in whole or in part may be granted by the head of the major department or the Dean of the Graduate College when in his or her judgment the proposed use of the material is in the interests of scholarship. In all other instances, however, permission must be obtained from the author.

SIGNED: Paul David Husbands

APPROVAL BY THESIS DIRECTOR

This thesis has been approved on the date shown below:

Alfred W. Kaszniak
Alfred W. Kaszniak, Ph.D.
Professor of Psychology

12/8/87
Date

ACKNOWLEDGEMENTS

There are many individuals that have given me support and guidance during the time of this study and I am granted the following space to acknowledge them. Without them this study could not have been done.

First, I would like to acknowledge the support and love of my whole family. My brothers and sisters have paved the road to success for me, and have taught me how valuable "the little things in life can be." To my father and mother, the greatest people I have ever known, I give you my greatest piece of work. You have never let me down, and any success I achieve is because of you.

Second, I would like to recognize the members of my thesis committee. Dr. Lynn Nadel, although I have not known you very long, your work and presence on my committee has pushed me to strive for the best work possible. Dr. Jim Allender, you have always had your door open for me and have listened to my concerns and ideas. Your contributions have made me a better student. Finally, Dr. Alfred Kaszniak, I believe there is no better role model for any student to follow. Your knowledge, patience, courtesy, and support have earned my greatest respect. I someday hope to be half the professional you are.

Next, let me thank the peers and friends who have supported me and have made contributions to this study. Dr. "Skip" Stebbins, thank you for the guidance, support, and work you put in with some of the data

collection; you are a true friend. Dr. Rex Swanda, thank you for the advice and work with data collection. Dr. Lee Sechrest, I would not be here if it was not for your confidence in me. Let this work be a testimony to my statement that "I would make you proud."

I would also like to thank Maryruth Farrell for her hard work and patience with my "never ending" revisions. You were very supportive to me during this stressful period.

I would like to thank my wife, Kimberly, most of all. You have supported me in every endeavor I have undertaken. Your support and love has pulled me through the hard times and never left me without hope. Thank you for sacrificing so much for what at times seems so little. I am a better human being because of you and realize every day that I am the luckiest man in the world.

Finally, to my brother Robby, although your cognitive faculties will not permit you to comprehend this, I want to thank you for giving me more than any human being ever could.

TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES	v
ABSTRACT	vi
INTRODUCTION	1
Hypotheses	8
METHOD	10
Subjects	10
Procedure	13
RESULTS	16
Univariate Analyses of Variance	16
DISCUSSION	27
APPENDIX: REVIEW OF LITERATURE	35
REFERENCES	59

LIST OF TABLES

		<u>Page</u>
1	Mean and (Standard Deviations) of Demographic Variables	12
2	Mean and (Standard Deviations) of Wechsler Memory Logical and Visual Reproduction Subtests Between Three Subject Groups	17
3	Comparison of Wechsler Memory Logical and Visual Reproduction Subtests Between Three Subject Groups	18
4	Mean and (Standard Deviations) of Primary Memory, Secondary Memory, Prior Item and Extra List Errors Between Three Subject Groups	19
5	Comparison of Free Recall Variables Between Three Subject Groups	21
6	Mean and (Standard Deviations) of True Positives, False Positives, True Negatives, and False Negatives Between Three Subject Groups	24
7	Comparison of Recognition Variables Between Three Subject Groups	25

Abstract

Previous research concerning the differences in memory of normal and impaired elderly has focused primarily on standard quantitative psychometric aspects. Quantitative psychometric measures alone, however, are not always sufficient to differentiate diagnostic groups. The present study investigated quantitative and qualitative aspects of memory in three age-and-education-matched groups (1) 38 normal elderly, (2) 15 patients with dementia of the Alzheimer's type (DAT), and (3) 26 depressed elderly. Four clusters of dependent variables were used to examine possible differences between the groups: (1) demographic, (2) standard psychometric (Wechsler Memory Scale logical memory and visual reproduction subtests), (3) experimental verbal recall measures (free verbal recall measures of primary memory, secondary memory, prior item intrusions and extra list intrusions), and (4) experimental verbal recognition memory measures (true positive, false positive, true negative, and false negative responses).

Dementia patients were expected to be significantly lower on all tasks compared to both the depressed and normal elderly. Depressed patients were expected to perform similarly to normal older adults but were predicted to make more prior item intrusion and false negative errors than normal elderly.

Analyses of variance, with specified contrasts, found the DAT patients to differ from normal elderly on all variables but prior item

intrusions, false negative and true positive recognition errors. All variables but prior item intrusions, false negative and true positive recognition errors differentiated the DAT group from the depressed elderly. The depressed elderly demonstrated lower secondary memory recall scores, produced more false positive recognition errors, and registered fewer true negative responses than normal adults.

Results support previous findings that DAT patients suffer from a pervasive memory deficit. The depressed elderly were impaired on the secondary memory measure, and demonstrated deficits in the accurate detection of distractor items on the recognition memory task. This is discussed in terms of a deficit in effortful cognitive processing.

INTRODUCTION

The purpose of the present study was to investigate quantitative and qualitative aspects of memory performance in patients with dementia of the Alzheimer's type (DAT), older depressed adults, and healthy older individuals. Since much of the current literature on differentiating a DAT patient from an older depressed individual had relied on quantitative measures, this study addressed primarily the qualitative aspects of memory performance in the three groups. It investigated the role of qualitative aspects of memory performance in the differentiation of DAT from depression. This study also sought to elicit an understanding of the theoretical constructs of memory in the healthy elderly, depressed elderly, and older adults with DAT. A select review of the relevant literature offers a perspective on both the importance and difficulties involved in differentiating a DAT patient from a depressed older adult.

Primary Degenerative Dementia, the term employed in the third edition of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 1980) for those dementias thought attributable to either Alzheimer's or Pick's diseases, is an organic mental disorder characterized by an insidious onset and gradual progressive course, "for which all other specific causes have been excluded by the history, physical examination, and laboratory tests" (American Psychiatric Association, 1980, p. 124). The dementia involves a multifaceted loss of intellectual abilities, such as

memory, judgment, abstract thought, and other higher cortical functions, and changes in personality and behavior. The diagnosis of dementia is warranted only if intellectual deterioration is of sufficient severity to interfere with social or occupational functioning. Diagnosis is complicated by the fact that the normal process of aging includes a variety of changes in intellectual functions. There are also a number of mental disorders that can closely mimic dementia. These disorders fall under the label of "pseudodementia."

In 1961 Kiloh wrote what some still consider the most comprehensive paper on pseudodementia. Kiloh noted that the term pseudodementia "is purely descriptive and carries no diagnostic weight" (Kiloh, 1961, p. 336). He defined pseudodementia as a syndrome in which initially "the picture of dementia may be very closely mimicked" (Kiloh, 1961, p. 336), but the subsequent course of the illness is incompatible with the diagnosis of dementia. Kiloh described ten patients with functional disorders who manifested to varying degrees the classic changes of dementia: impairment of orientation, memory, judgment, and intellectual changes. Although Kiloh noted a variety of psychiatric disorders that could present with pseudodementia, he emphasized depressive illness. Kiloh asserted that psychometric testing, radiological studies, cortical biopsy, and EEG were not particularly helpful in differentiating true dementia from pseudodementia, and that other diagnostic features such as a past psychiatric history, a short history with abrupt onset, and even the results of a therapeutic trial of antidepressant therapy were the most sensitive diagnostic tools (Kiloh, 1961).

Pseudodementia is the syndrome in which "dementia is mimicked by functional psychiatric disorders" (Wells, 1979, p. 895). Patients with pseudodementia present symptoms and give responses to mental status examination questions that are much like those seen in verified cases of dementia, but their clinical distress is the result of functional psychiatric disorders and not primarily of underlying organic brain disease. The topic has received relatively little attention in either the psychiatric or the neurological literature (Wells, 1979). The phenomenon is, however, not rare and exists largely within older populations or in those patients with psychiatric problems. From published reports it can be inferred that pseudodementia is usually recognized only after the patient has unexpectedly recovered. Thus as Kiloh (1961) pointed out, pseudodementia patients are in danger both of therapeutic neglect and of diagnostic procedures that are not only superfluous, but possibly dangerous.

Wells (1979) reported a very careful study of ten patients with pseudodementia. He noted that pseudodementia could be associated with a wide variety of psychiatric illnesses, including personality disorders and posttraumatic neuroses, and that in his population the association with primary affective disorders was not as high as in other studies. Post (1975) further outlined several clinical features that, taken together, could help differentiate pseudodementia from dementia. These included a previous history of psychiatric illness, symptoms of short duration before help is sought, rapid progression of symptoms, vociferous complaints of cognitive deficits, behavior and

cognitive performance inconsistent with the apparent degree of cognitive dysfunction, "don't know" answers and variability of performance. These features, Post pointed out, tend to be characteristic of pseudodementia and not of dementia.

Growing evidence suggests that the mimicry of dementia by functional psychiatric disorders occurs with some frequency and that, as a result, dementia is overdiagnosed (Duckworth and Ross, 1975; Garcia, Reding, and Blass, 1981; Haward, 1977; Heston and Mastri, 1982; Madden, Luhan, and Kaplan, 1952; Marsden and Harrison, 1972; Nott and Fleminger, 1975). Kaszniak (1987) suggested several reasons for the difficulty in differentiating dementia from depression and normal aging. First he posited that there are changes in cognitive functioning which accompany normal aging, somewhat confusing the distinction between normal age-changes and early indicators of dementia. There is evidence that secondary, or long term memory changes with normal aging (Poon, 1985). Second, older patients complain more than younger adults of memory difficulty (Kral, 1962; Reisberg and Ferris, 1982; Sluss, Rabins, Gruenberg, and Reedman, 1980; Zelinsky, Gilewski, and Thompson, 1980). Third, cognitive difficulty frequently accompanies depression in the elderly, and can be of sufficient severity to be confused with dementia (Caine, 1986; McAllister, 1981; W.R. Miller, 1975). Finally, Kaszniak (1987) suggested that the occurrence of depression in a dementing illness, and the resemblance of certain features of dementing illnesses to those of depression lead to difficulty in differentiating dementia

from depression. Other reports (Demuth and Rand, 1980; Kaszniak, 1986; McAllister and Price, 1982; N.E. Miller, 1980; Post, 1962) have supported these ideas.

Many investigators (Bayles and Kaszniak, 1987; Botwinick, 1973; Gibson, 1981; La Rue, D, Elia, Clark, Spar, Jarvik, 1986; E. Miller, 1971; E. Miller, 1977; Sjogren, Sjogren, and Lindgren, 1953; Whitehead, 1973; Wilson, Bacon, Fox, and Kaszniak, 1983; Wilson, Bacon, Fox, Kramer, and Kaszniak, 1983) have demonstrated that memory loss is a prominent feature of DAT. These studies indicate that memory loss is typically an early sign of this dementia. With the progression of the dementia, there is a widespread loss of memory, affecting both primary and secondary memory processes. Wilson, Bacon, Fox and Kaszniak, (1983) reported that secondary memory was more severely impaired in DAT than primary memory. Gibson, (1981) using a verbal free recall task, reported that memory loss in dementia differed from that of either normal aging or depression along both quantitative (number of words recalled compared to healthy and depressed groups) and qualitative (shape of serial position curve different than healthy and depressed groups) dimensions. Miller and Lewis (1977) using a signal detection analysis applied to recognition memory data, concluded that DAT patients had a widespread memory deficit (not explained by any systematic response bias) that disrupted performance on most memory tasks.

The evidence for memory impairment in depression is much less clear than that found for DAT. Controversy exists within the literature concerning the existence and/or extent of memory impairment

in depressed older adults. There are a number of studies that have reported the existence of memory deficit in depressed patients (Caine, 1986; Gibson, 1982; Kendrick and Post, 1967; McAllister, 1981; W.R. Miller, 1975; Sternberg and Jarvik, 1976; Stromgren, 1977; Whitehead, 1973).

Conversely, other studies have reported no impairment in the overall level of memory performance in depressed subjects (Kahn, Zarit, Hilbert, and Niederehe, 1975; Miller and Lewis, 1977; Niederehe, 1986; Niederehe and Camp, 1985; Orme, 1957). Beck's (1972) review concluded that research had not consistently found overall inadequacy of cognitive functions in depression. Other research indicated that memory complaint existed among depressed elderly even when objective assessment of memory failed to document a deficit (Kahn, Zarit, Hilbert, and Niederehe, 1975; Larrabee and Levin 1986).

Thus, the current literature on memory functioning leaves unresolved a number of questions regarding the impact of depression on memory performance. Much of the research concerned with quantitative differences in the memory performance of depressives has focused on elderly patients, but research concerned with qualitative changes in memory, as a result of depression, has dealt less with the aged (Niederehe, 1986). Miller and Lewis (1977) demonstrated depressed elderly to exhibit stricter decision criteria (a type of response bias), compared to normal elderly and DAT patients, on a recognition memory task. This manifests as an extremely low willingness to guess (a conservative response bias) on the part of the depressed.

Niederehe (1986) demonstrated that while depressed elderly did not significantly differ from healthy older adults in performance on either a free recall or recognition task, they manifested conservative decision criteria (i.e., a tendency toward disproportionate numbers of false negative errors) which differed from the more liberal criteria of both normal and organically impaired elderly. Finally, Weingartner (1986) demonstrated depressed elderly to be impaired on "effortful" cognitive processing tasks (defined below) compared to healthy elderly. The depressed elderly did not differ from healthy older adults on more "automatic" cognitive processing tasks. It thus appeared from these qualitative studies that the depressed elderly did not suffer from an intrinsic impairment in the structure of memory, but rather, exhibited conservative response bias, low motivation, lack of effort, and/or possibly an arousal deficit.

Existing literature concerned with the differentiation of DAT patients from depressed and healthy elderly, as reviewed above, reveals the need for: (1) development of methods to assist in differential diagnosis and (2) further understanding of memory functioning in DAT, depressed and healthy older adult populations. Qualitative measures (defined below) have been chosen to develop a better understanding of the types of errors made by the three samples in this study.

Hypotheses

The present study seeks to contribute to the small but growing literature focusing on differences between depression, DAT, and normal older age, with regard to memory. Normal elderly persons are compared

to age-and-education-matched DAT and depressed patients, utilizing subtests of the Wechsler Memory Scale (Wechsler, 1945); a free recall task, using measures of primary and secondary memory, with analysis of the types of errors made (extra-list vs. prior item); and analysis of recognition memory task performance. Based on the literature reviewed above, three hypotheses are proposed:

1. The DAT group will display greater impairment than depressed and normal elderly on both the verbal memory and visual reproduction memory subtests of the Wechsler Memory Scale, reflecting the pervasive memory loss in DAT.
2. The DAT group will demonstrate greater impairment on both primary and secondary memory measures than the normal and depressed group, as determined by the free verbal learning task. DAT patients will also produce a higher number of extra-list errors than the normal and depressed elderly, on the free verbal learning task. Depressed elderly will perform similarly to normals but will produce a higher number of prior-item errors than both the DAT patients and healthy elderly group.
3. DAT patients will produce a higher number of both false positive and false negative errors than depressed and normal elderly, as determined by the recognition task. This again will be due to the pervasive memory loss in DAT patients. Depressed elderly will perform similarly to normals but will produce a higher number of false negative errors than the

healthy elderly group. The depressed elderly, as reviewed above, have been found to typically respond with a conservative response bias.

METHOD

Subjects

Fifteen DAT patients (mean age 67.00), 38 healthy individuals (mean age 69.24), and 26 depressed patients (mean age 69.54) (see Table 1) comprised the samples for this study. The healthy volunteers from the community were paid for their participation in the project. They were free of evidence of dementia, major psychiatric disorder, or major systemic illness. All subjects had at least an eighth grade education, and were free of any uncorrected visual or auditory impairment. All subjects received a physical and neurological examination, computerized tomographic (CT) scan, EEG, a psychiatric interview, and extensive neuropsychological examination. The DAT patients met DSM-III criteria (American Psychiatric Association, 1980) for dementia, and underwent a series of laboratory procedures in order to rule out various infections, toxic or metabolic disturbances (see Kaszniak, Garron, and Fox, 1979, for details). The diagnosis of DAT required a history of cognitive decline and absence of evidence of focal lesion, major systemic illness, delirium, or major psychotic symptoms. The Hachinski Ischemic Scale (Hachinski, Lassen and Marshall, 1974) was used to assist in ruling out patients suspect of multi-infarct dementia. In addition, all DAT patients failed to meet DSM III (American Psychiatric Association, 1980) criteria for major

depression or dysthymia. The present sample of DAT patients meets the NINCDS-ADRDA (McKhann, Drachman, Folstein, Katzman, Price, and Stadlan, 1984) criteria for a clinical diagnosis of probable Alzheimer's Disease. No patients were institutionalized at the time of the study.

The depressed patient sample was obtained as part of an antidepressant drug study being conducted at the University of Arizona College of Medicine. Twenty-six depressed patients (mean age 69.54) (see Table 1) volunteered to participate in an experimental drug study examining the drug's effects on major depression. Subjects gave informed consent and were not paid for their participation. Subjects met DSM-III criteria for major depression, and were free of any significant medical problems or evidence of dementia, as determined by interview, history, and physical examination. Diagnosis of depression was supported by psychiatric interview, a rating of greater than 18 on the Hamilton Rating Scale for depression (Hamilton, 1960) and a Beck Depression Inventory score greater than 11 (Beck, Ward, Mendelson, Mock, and Erbaugh, 1961). Subjects were not receiving any centrally active medication at the time of the present study (all drugs were discontinued three weeks prior to the present data collection as a drug "wash out" period prior to initiation of the experimental drug or placebo).

For the present study, the two clinical groups and the healthy comparison group were matched on age and education (see Table 1). Seven potential DAT participants were dropped because they did not

Table 1

Means (and Standard Deviations) in Years of Demographic Variables for Three Groups.

	<u>Age</u>	<u>Age Ranges</u>	<u>Education</u>	<u>Education Ranges</u>
Normal Elderly	69.24 (6.41)	67.13 - 71.34	13.11 (2.82)	12.18 - 14.03
DAT Patients	67.00 (6.41)	63.45 - 70.55	11.73 (2.34)	10.44 - 13.03
Depressed Patients	69.54 (3.52)	68.12 - 70.96	13.27 (3.32)	11.93 - 14.61

DAT = Dementia of the Alzheimer Type

meet the criterion of at least an eighth grade education level. This deletion was done blind to all dependent variables, and enabled a close age-and-education-matching of the three groups.

Procedures

The Wechsler Memory scale (WMS) (Wechsler, 1945) is a commonly employed protocol for the psychometric assessment of memory. The instrument enabled comparisons between groups on the desired subscales. The WMS was included because its subtests have been shown to validly differentiate DAT patients from age, sex, and education-matched controls (Brinkman, Lergen, Gerganoff, and Pomara, 1983; Logue and Wyrick, 1979).

A second measure was that of a free verbal learning task, involving both a free recall (Wilson and Kaszniak, 1986) and a recognition memory portion (Wilson, Bacon, Fox, Kramer, and Kaszniak, 1983). The free recall task involved presenting subjects with four, twelve-word lists, each followed by a free recall trial. The words were read and shown on index cards at a two second per word rate, with recall immediately after list presentation. The lists were balanced for free recallability (Christian, Bickley, Tarko, and Clayton, 1978). Word order within lists and list order across subjects were randomly arranged.

Following Tulving and Colotla (1970), free recall was divided into primary memory (PM) and secondary memory (SM) components based on the number of words between presentation and recall, with a cutoff of six between PM and SM (Watkins, 1974). Thus, a word presented in the ninth position and recalled fifth has seven items intervening between

presentation and recall and would be assigned to SM. This procedure for measuring PM and SM has been supported by both experimental (Watkins, 1974) and neuropsychological (Moscovitch, 1982) evidence.

Previous research employing this free recall task (Wilson, Bacon, Fox, and Kaszniak, 1983) found PM to be impaired in DAT patients (relative to matched healthy controls), and further indicated that the size of the patients' PM deficit increased linearly with increasing number of items between presentation and recall. SM was more severely impaired than PM in the patient group. These findings provided support for the validity of the PM and SM free recall measures in differentiating DAT patients from healthy older individuals. As predicted by the literature concerning memory in normal aging (see Kaszniak, Poon, and Reige, 1986, for review), age was related to SM ($r = -.33$), but not to PM ($r = .09$) (Wilson, Bacon, Fox, and Kaszniak, 1983). Interestingly, for DAT patients ($n=47$), the PM and SM measures were not independent ($r=.45$). This observation suggests that the DAT patients' SM deficit was at least partially due to impaired PM. Other investigators (Diesfeldt, 1978; E. Miller, 1971), employing free recall tasks to investigate PM and SM in DAT patients have come to the same conclusion.

After presentation and free recall trials of all four lists, subjects were given a recognition test consisting of 96 words, half targets (words from free recall lists) and half distractors. Targets and distractors were equated for free recallability and word frequency. Subjects made a forced "yes-no" response for each of the 96 words, and rated their confidence on a three point scale. From

this, the number of "hits" (true positives and true negatives) and "misses" (false positives and false negatives) were calculated and analyzed.

RESULTS

A series of analyses of variance were conducted comparing three different groups on four clusters of dependent measures. An alpha level of .01 was used to determine significant group differences between the healthy elderly (n=38, mean age = 69.24); the DAT group (n=15, mean age = 67.00); and the depressed group (n=26, mean age = 69.54). The four clusters of dependent measures were (1) demographic variables (age, sex, and education), (2) Wechsler Memory variables (logical memory and visual memory), (3) free recall variables (primary memory, secondary memory, prior item intrusion errors, and extra-list intrusion errors), and (4) recognition variables (true positive, false positive, true negative, and false negative responses). In addition to overall group differences, planned contrasts were used to test for the predicted locus of the group effect for each analysis.

Means and standard deviations for all dependent measures are presented for the three groups in Table 1 (demographic); Table 2 (Wechsler Memory); Table 4 (free recall); and Table 6 (recognition memory).

Univariate Analyses of Variance

Logical memory. A univariate analysis of variance found the groups to significantly differ on logical memory ($F = 35.42$, d.f. = 2, 76, $p < .0001$) (see Table 3). Three planned contrasts using pooled variance estimates (identical throughout the analyses), revealed

Table 2

Means and (Standard Deviations) of Wechsler Memory Logical and Visual
Reproduction Subtests Between Three Subject Groups.

	<u>Wechsler Memory Logical</u>	<u>Wechsler Memory Visual</u>
Normal Elderly	8.37 (2.53)	8.11 (3.30)
Dementia Patients	2.07 (1.98)	2.60 (1.96)
Depressed Elderly	8.17 (2.92)	8.27 (3.24)

Table 3

Comparison of Wechsler Memory Logical and Visual Reproduction Subtests Between Three Subject Groups.

Dependent Measure	Source of Variance	Analysis of Variance				
		DF	SS	MS	F	P
Wechsler Memory Logical	Between	2	470.66	235.33	35.42	.0001
	Within	76	504.90	6.64		
Wechsler Memory Visual	Between	2	377.68	188.84	19.93	.0001
	Within	76	720.29	9.48		

Dependent Measure	Source of Variance	Specified Contrasts Using Pooled Variance Estimates			
		t value	DF	P	
Wechsler Memory Logical	Contrast 1	8.02	76	.0001	
	Contrast 2	.31	76	.758	
	Contrast 3	-7.29	76	.0001	
Wechsler Memory Visual	Contrast 1	5.86	76	.0001	
	Contrast 2	-.21	76	.835	
	Contrast 3	-5.68	76	.0001	

Contrast 1 - Compares normal elderly to dementia patients

Contrast 2 - Compares normal elderly to depressed elderly

Contrast 3 - Compares dementia patients to depressed elderly

Table 4

Means and (Standard Deviations) of Primary Memory, Secondary Memory, Prior Item and Extra List Errors Between Three Subject Groups.

	<u>Primary Memory</u>	<u>Secondary Memory</u>	<u>Prior Item Errors</u>	<u>Extra List Errors</u>
Normal Elderly	9.55 (2.32)	14.37 (5.04)	1.37 (1.30)	.82 (.80)
Dementia Patients	6.33 (2.23)	2.87 (2.17)	.80 (.94)	3.40 (4.10)
Depressed Elderly	9.19 (2.59)	10.65 (3.68)	1.77 (1.77)	1.08 (1.55)

Data represent sums across all four lists.

significant differences between the normal elderly and dementia patients ($t = 8.02$, $p < .0001$), and between dementia patients and depressed elderly ($t = -7.29$, $p < .0001$) (see Table 3).

Visual memory. A univariate analysis of variance revealed the groups to significantly differ on visual memory ($F = 19.93$, $d.f. = 2$, 76 , $p < .0001$) (see Table 3). Contrast comparisons yielded significant differences between the normal elderly and dementia patients ($t = 5.86$, $p < .0001$), and the dementia patients and depressed elderly ($t = -5.68$, $p < .0001$) (see Table 3).

Free verbal recall. Primary memory. A univariate analysis of variance found the groups to significantly differ on primary memory ($F = 10.16$, $d.f. = 2$, 76 , $p < .0001$) (see Table 5). Significant contrasts were those comparing normal elderly to dementia patients ($t = 4.40$, $p < .0001$), and dementia patients versus depressed elderly ($t = -3.68$, $p < .0001$) (see Table 5).

Free verbal recall. Secondary memory. A univariate analysis of variance found the groups to significantly differ on secondary memory ($F = 40.32$, $d.f. = 2$, 76 , $p < .0001$) (see Table 5). Significant contrasts were found with all three comparisons: normal elderly compared with dementia patients ($t = 8.97$, $p < .0001$), normal elderly with depressed elderly ($t = 3.47$, $p < .001$), and dementia patients with depressed elderly ($t = -5.71$, $p < .0001$) (see Table 5).

Free verbal recall. Prior item errors. A univariate analysis of variance did not find a difference between the groups on prior item errors (see Table 5).

Table 5

Comparison of Free Recall Variables Between Three Subject Groups.

Dependent Measure	Source of Variance	Analyses of Variance				
		DF	SS	MS	F	P
Primary Memory	Between	2	116.75	58.38	10.16	.0001
	Within	76	436.77	5.75		
Secondary Memory	Between	2	1426.43	713.21	40.32	.0001
	Within	76	1344.46	17.69		
Prior Item Errors	Between	2	8.98	4.49	2.22	.1159
	Within	76	153.86	2.02		
Extra List Errors	Between	2	75.68	37.84	9.01	.0003
	Within	76	319.16	4.19		

<u>Specified Contrasts Using Pooled Variance Estimates</u>				
Dependent Measure	Source of Variance	t value	DF	P
Primary Memory	Contrast 1	4.40	76	.0001
	Contrast 2	.59	76	.557
	Contrast 3	-3.68	76	.0001
Secondary Memory	Contrast 1	8.97	76	.0001
	Contrast 2	3.47	76	.001
	Contrast 3	-5.71	76	.0001
Prior Item Errors	Contrast 1	1.31	76	.194
	Contrast 2	-1.11	76	.272
	Contrast 3	-2.10	76	.039

Table 5 (Continued)

<u>Specified Contrasts Using Pooled Variance Estimates</u>				
<u>Dependent Measure</u>	<u>Source of Variance</u>	<u>t value</u>	<u>DF</u>	<u>P</u>
Extra List Errors	Contrast 1	-4.14	76	.0001
	Contrast 2	-.50	76	.618
	Contrast 3	3.49	76	.001

Contrast 1 - Compares normal elderly to dementia patients
 Contrast 2 - Compares normal elderly to depressed elderly
 Contrast 3 - Compares dementia patients to depressed elderly

Free verbal recall. Extra list errors. A univariate analysis of variance found significant group differences ($F = 9.01$, d.f. = 2, 76, $p < .0003$) (see Table 5). Significant contrasts were those comparing normal elderly to dementia patients ($t = -4.14$, $p < .0001$), and dementia patients to depressed elderly ($t = 3.49$, $p < .001$) (see Table 5).

Recognition memory. True positive responses. A univariate analysis of variance found no difference between the groups on true positive responses (see Table 7).

Recognition memory. True negative responses. A univariate analysis of variance found the groups to significantly differ on true negative responses ($F = 25.55$, d.f. = 2, 75, $p < .0001$) (see Table 7). Significant contrasts were those comparing normal elderly to dementia patients ($t = 7.14$, $p < .0001$), normal elderly to depressed elderly ($t = 2.66$, $p < .010$), and dementia patients to depressed elderly ($t = -4.69$, $p < .0001$) (see Table 7).

Recognition memory. False positive errors. A univariate analysis of variance found the groups to differ on false positive errors ($F = 27.37$, d.f. = 2, 75, $p < .0001$) (see Table 7). Significant contrasts were those comparing normal elderly to dementia patients ($t = -7.40$, $p < .0001$), dementia patients to depressed elderly ($t = 5.00$, $p < .0001$), and normal elderly to depressed elderly ($t = -2.57$, $p < .012$) (see Table 7).

Recognition memory. False negative errors. A univariate analysis of variance demonstrated no difference between the groups on false negative errors (see Table 7).

Table 6

Means and (Standard Deviations) of True Positives, False Positives, True Negatives and False Negatives Between Three Subject Groups.

	<u>True Positive</u>	<u>False Positive</u>	<u>True Negative</u>	<u>False Negative</u>
Normal Elderly	36.55 (6.55)	5.47 (3.74)	42.53 (3.74)	11.42 (6.47)
Dementia Patients	31.79 (9.51)	22.29 (12.46)	25.57 (12.31)	16.21 (9.51)
Depressed Elderly	37.12 (6.77)	10.23 (7.55)	37.38 (8.57)	10.88 (6.77)

Table 7

Comparison of Recognition Variables Between Three Subject Groups.

Dependent Measure	Source of Variance	Analyses of Variance				
		DF	SS	MS	F	P
True Positive	Between	2	291.56	145.78	2.79	.0674
	Within	75	3910.41	52.14		
True Negative	Between	2	2946.79	1473.39	25.55	.0001
	Within	75	4325.06	57.67		
False Positive	Between	2	2892.59	1446.29	27.37	.0001
	Within	75	3962.95	52.84		
False Negative	Between	2	292.91	146.45	2.84	.0649
	Within	75	3872.27	51.63		

Specified Contrasts Using Pooled Variance Estimates				
Dependent Measure	Source of Variance	t value	DF	P
True Positive	Contrast 1	2.11	75	.038
	Contrast 2	-.31	75	.760
	Contrast 3	-2.23	75	.029
True Negative	Contrast 1	7.14	75	.0001
	Contrast 2	2.66	75	.010
	Contrast 3	-4.69	75	.0001

Table 7 (Continued)

Dependent Measure	Specified Contrasts Using Pooled Variance Estimates			
	Source of Variance	t value	DF	P
False Positive	Contrast 1	-7.40	75	.0001
	Contrast 2	-2.57	75	.012
	Contrast 3	5.00	75	.0001
False Negative	Contrast 1	-2.13	75	.036
	Contrast 2	.29	75	.770
	Contrast 3	2.24	75	.028

Contrast 1 - Compares normal elderly to dementia patients
 Contrast 2 - Compares normal elderly to depressed elderly
 Contrast 3 - Compares dementia patients to depressed elderly

DISCUSSION

The present study attempted to document the qualitative and quantitative aspects of memory performance in depressed, normal elderly and DAT patient participants. Findings indicate that there are clear qualitative and quantitative memory deficits in DAT patients (in comparison to healthy elderly persons), although the results for the depressed sample are mixed.

The existing literature is filled with controversy over the effects of depression on memory performance. Niederehe (1986) asserted that the existing research presents an unclear picture of the precise nature of memory deficits in depression. The present study utilized a moderately depressed, well educated sample of outpatient subjects. They were free from any medication at the time of the study. The results are consistent with those of studies that have either failed to document clear memory differences between depressed and normal older adults, or have found only minimal differences. As suggested by Niederehe (1986), those studies documenting substantial differences between the two groups have used hospitalized samples or patients with relatively severe depressive disorders, as well as patients with low educational and socioeconomic backgrounds (Niederehe, 1986).

The present study did reveal an interesting difference between depressed and normal elderly. The depressed group performed as well as the normal elderly on the primary memory index, but scored lower on the secondary memory measure. This intact primary memory finding appears to

support Whitehead's (1973) result that outside of the rote learning paradigm, depressed elderly have been shown to have normal capacity for span of immediate recall and reproduction of a story immediately after presentation. However, Whitehead (1974) also showed that depressed elderly are impaired, in comparison to patients whose depression was in remission, on a recall task of unfamiliar words. The findings of the present study, together with Whitehead's results, support the notion that depressed elderly are impaired on tasks requiring active manipulation of material (recall of unfamiliar words and recall from secondary memory). The depressed elderly, however, have not demonstrated impairment on tasks that required automatic or unmanipulated information (digit span, familiar words, and recall from primary memory). Similarly, they were not impaired on tasks that involved cued recall, or the utilization of schematic prompts as in the case of recalled paragraphs.

The present study, unlike the previous studies that may have administered a simple free recall procedure, utilized a sensitive free verbal recall scoring procedure (Tulving and Colotla, 1970) that produced primary and secondary memory measures. It is likely that the use of this sensitive and specific measure of secondary memory free recall was responsible for the present findings, demonstrating depressed elderly to be impaired in secondary memory compared to normal elderly. This conflicts with a failure to find group differences in those studies that utilized simple free recall measures of memory, without separation of primary and secondary memory components (e.g., Niederehe, 1986).

The present findings are relevant to the "automatic-effortful" hypothesis presented by Weingartner (1986). He posited that, although automatic or superficial information processing did not differentiate depressed from normal elderly, effort-demanding cognitive processes were affected in depression. It may thus be argued that the primary memory scores of the depressed group reflected their ability to perform well on automatic processing tasks. The information held in primary memory requires a limited amount of cognitive and manipulative processing, and thus may be thought of as an automatic process. Secondary memory, however, requires an individual to more deeply encode and process information. The inability of an individual to actively encode, process, store, and retrieve information from secondary memory may directly relate to his/her inability to maintain an effortful cognitive process. The present results support Weingartner's (1986) notion that memory in depressed individuals is impaired when effort-demanding cognitive tasks are employed.

In addition, there appears to be a conflict with Whitehead's (1973) study that demonstrated no impairment in depressed elderly on delayed recall of a paragraph. The utilization of a paragraph for both immediate and delayed recall involves the potential use of schematic or well learned "scripts" by the subject to cue recall. Thus, the recall of the paragraph may not involve the need for active integrative or manipulative (effortful) processing to perform well. Rather, the subject may rely on the use of previously established schemas, or what Craik (1984) referred to as "strong stimulus-response connections," to prompt recall. The free verbal recall task, however, does not provide

schematic cues for the subject to utilize in recall. There is an inherent need for active integration and the production of new patterns and connections of the presented words for accurate recall.

This study failed to find a difference between depressed elderly and normal adults in the number of prior item intrusion errors. The depressed, however, did demonstrate a nonsignificant trend towards a greater number of prior item intrusions compared to DAT patients. Likewise, and in contrast to the results of previous research (e.g., Niederehe, 1986), the depressed elderly did not differ from normal adults on false negative recognition errors. The depressed, however, did produce a greater number of false positive recognition errors and a lower number of true negative responses, compared to normals. One explanation for this finding may be that the normal elderly sample, used in this study, performed phenomenally well on the recognition memory task. The performance of the depressed patients, in comparison to the performance of the normal elderly, therefore appears poor.

The DAT group, demonstrated significant differences relative to normal adults on all measures except for prior item intrusions, false negative and true positive recognition errors. The relatively low number of prior item intrusions made by the DAT group (nonsignificant trend towards being lower than depressed elderly), is consistent with results of previous research (Wilson, Bacon, Fox, and Kaszniak, 1983) in which little evidence for proactive interference, on this task, was found in the dementia sample. The nonsignificant trend towards lower prior item intrusion errors, on the part of the DAT sample, is consistent with the conclusion that they have not adequately encoded and

stored the previously presented information, hence it does not interfere with future encoding. Wilson, et al. (1983), using the same Tulving and Colotla (1970) free recall scoring procedure, reported that the PM and SM measures were correlated in their dementia sample, unlike the statistical independence of these measures observed in their normal elderly group. These authors also reported that the deficits in the DAT sample emerged early, after only three intervening items, well before the cutoff point between PM and SM. These results are consistent with the conclusion that in DAT patients, an initial processing deficit exists. The initial processing deficit in the DAT sample may be a major contributing factor to the magnitude of their secondary memory deficit.

The dementia patients showed a greater number of extra-list intrusion errors on the free recall task, in comparison to both the depressed and normal elderly. This is consistent with Whitehead's (1973) finding that dementia patients are characterized by random or "task irrelevant" type errors. This may be the result of a lack of organization, direction and/or strategy on the part of the DAT group when approaching cognitive tasks. The DAT patient seemingly fails to comprehend and appreciate the context of the task (free verbal recall) before them. He/she apparently cannot develop or integrate patterns and connections or produce featural cues of the "to be recalled" words. Without the benefit of retrieving previously learned information that is relevant to the task at hand, the DAT patient relies on a nonsystematic style of responding. He/she appears unable to perform the organized search process required for adequate retrieval from semantic memory. This semantic memory deficit has been shown to be interrelated with the

deficit in episodic memory retrieval of DAT (Weingartner et al., 1983). Weingartner and colleagues (1983) argued that the severity of the DAT patient's episodic verbal memory deficit cannot be sufficiently accounted for by the lack of effortful encoding observed with depression. Rather, it appeared that additional deficits in the access to semantic memory must be invoked.

The DAT sample demonstrated fewer true negative and more false positive recognition errors, compared to both normal and depressed elderly. The DAT sample also demonstrated nonsignificant trends towards making more false negative errors, and fewer true positive recognition responses than the other two groups. These results are consistent with the results of previous research (e.g., Miller and Lewis, 1977).

Within the present study, there was little difficulty in quantitatively differentiating depressed elderly from DAT patients. Likewise, the DAT sample was easily differentiated quantitatively from the normal elderly. Qualitatively, the dementia sample could also be easily differentiated from both the normal elderly and depressed elderly. The depressed elderly did not differ from the normal elderly on the quantitative psychometric measures (WMS) in this study. The secondary memory measure (presumed to reflect an effort-demanding cognitive process), as well as the number of true negative and false positive recognition memory responses, however, did differentiate the depressed sample from the normal elderly. The secondary memory finding points to specific deficits in even moderately depressed elderly that are revealed with effortful cognitive tasks, requiring continuous active processing. Such deficits may reflect amount of effort used, motivation

levels, aversive reactions, and so on. This selective deficit on effort-demanding memory tasks is different from the DAT group who demonstrated a pervasive impairment, affecting nearly all of the qualitative and quantitative indices used.

The inability of this study to better differentiate the depressed group from normal elderly needs to be addressed. The current depressed sample met DSM-III criteria for major depression and were labeled as "moderately depressed" with scores of greater than 18 on the Hamilton Depression Rating Scale (Hamilton, 1960). This sample was composed of outpatients with a moderately high level of education and socioeconomic background. Niederehe (1986) points out that, unlike the present study, those reports demonstrating substantial memory impairments in depression have used predominantly severely depressed inpatients with relatively low educational and socioeconomic backgrounds. Thus the level of depression may have impact on cognitive functioning and not all depressed elderly show such changes.

It remains clear that continued research is needed to understand what depression is and what effects it has on memory. A number of previous studies provide data supporting the presence of a conservative response bias in depression that may be affecting performance on memory tasks. This argues against an intrinsic memory deficit in depression, and more for a qualitative difference in response style. The results of the present study did not support the presence of a conservative response bias in the depressed sample. There is also the emerging possibility that depression is not a unitary syndrome with specific and predictable symptoms (Weingartner, 1986). Rather, there may exist

subtypes of depression, each characterized by different cognitive processes. Such processes may include response bias, motivational deficits, attentional deficits, and/or effortful processing deficits. Until these cognitive processes are more clearly understood, memory deficit cannot be confidently attributed to depression.

This study demonstrated the potential use of qualitative analysis for differentiating memory performance in a depressed versus a dementia patient. The effortful-processing memory measures, in particular, demonstrated differences between the depressed and normal groups. Unlike other studies that have been concerned with simple quantitative measures of verbal recall, this study separated free recall into primary and secondary memory components. The secondary memory component was sensitive enough to reveal a deficit, compared to normal elderly, even in the present moderately depressed sample. It is likely that with an inpatient sample of severely depressed elderly, the role of qualitative analysis in differentiating depressed elderly from dementia patients can be better understood. Specifically, research concerned with the automatic-effortful processing paradigm, response bias, and perhaps dual task procedures might better explain the effect of depression on memory performance. Ultimately, the qualitative mechanisms involved in memory processing, in a depressed individual, may be recognized and applied in the differentiation of depression from dementia.

APPENDIX
REVIEW OF LITERATURE

REVIEW OF LITERATURE

Diagnostic Difficulty

Growing evidence suggests that the mimicry of dementia by functional psychiatric disorders occurs with some frequency and that, as a result, dementia is over-diagnosed. A study (Duckworth and Ross, 1975) comparing the psychiatric diagnoses assigned elderly patients in New York, Toronto, and London, found that organic brain disorders were diagnosed 50% more frequently in New York than in either Toronto or London. Although differences in the patient populations might account for some discrepancy, it is more likely that elderly New York patients with functional disorders were incorrectly labeled as demented, whereas in Great Britain, where emphasis was put on the importance of functional geriatric disorders, elderly patients with functional disorders were more often recognized as such.

Other studies have supported the impression that false positive diagnoses of dementia occur with some frequency. Marsden and Harrison (1972) studied 106 consecutively admitted patients who were hospitalized, after preliminary screening by a consultant neurologist, psychiatrist, or both, for thorough neurological investigation of dementia. The diagnosis of dementia could not be substantiated in 19 cases (18%), and specific functional disorders were identified in 10 of these. In a similar fashion, Nott and Fleminger (1975) followed, for 1 to 15 years, 35 patients who were diagnosed as having presenile dementia, after thorough inpatient evaluation on the psychiatry ward

of a London teaching hospital: in only 15 cases (43%) did progressive mental deterioration confirm the initial diagnosis. Haward (1977) reported that of 49 patients with a provisional diagnosis of presenile dementia who were referred to a county mental hospital, 17 (34%) produced a psychometric picture incompatible with an organic disorder and suggestive of an endogenous depression. Following appropriate treatment, these patients showed a reversal of their apparent cognitive impairment.

Other previous studies help to establish a baseline of information emphasizing the need for careful assessment and diagnostic procedures for differentiating dementia from pseudodementia. Pseudodementia has been reported to occur in a wide variety of psychiatric disorders, including various personality disorders. In their study of 300 patients over the age of 45 seen in the psychiatric unit of a general hospital, Madden, Luhan, and Kaplan (1952) reported that symptoms ordinarily considered to indicate dementia could be reversed with appropriate psychiatric interventions. Such pseudodementia was noted in 10% of all cases (Madden, et al., 1952).

Recent research concerning accuracy in the diagnosis of dementia has indicated a range of from 10% to 30% of inaccurate diagnoses, in the general medical population (National Institute on Aging Task Force, 1980). The majority of such diagnostic errors appear to be false negative diagnoses, that is, failing to diagnosis dementia when it is present. One recent review (McCartney, 1986) has attributed the high rate of false negative diagnoses to physicians inadequately assessing intellectual functioning in older medical patients. However, as

previously discussed, concern has also been raised over false positive diagnoses, which Heston and Mastri (1982), evaluating clinical diagnoses against autopsy criteria, found to be approximately 30%. Garcia, Reding, and Blass (1981) reported a similar 25% rate of misdiagnosis, in their study of 100 older patients referred to a specialized outpatient dementia clinic. The majority of these misdiagnosed patients proved to be suffering from depression.

Dementia, Depression and Normal Aging

The differentiation of dementia from depression and normal aging can be extremely difficult. There appear to be several reasons for this difficulty (Kaszniak, 1987). First, there are changes in cognitive functioning which accompany normal aging, somewhat confusing the distinction between normal age-changes and early indicators of dementia. Zelinski, Gilewski, and Thompson (1980) reported that older patients complain more than younger adults of memory difficulty. Many elderly complain of some inability to remember recent and remote events, names, dates, phone numbers, and appointments. Complaints also often include trouble in reading comprehension, remembering thoughts in conversation, where something was placed, and what one had gone to the store to buy. Older persons may report more frequent use of mnemonics, such as keeping appointment books and making reminder notes (Kaszniak, 1987).

Healthy older individuals commonly complain of poor memory. In a study by Sluss, Rabins, Gruenberg and Reedman (1980), a survey of 111 normal older men participating in the Baltimore Longitudinal Study of Aging found 80% complained about memory difficulty. Kral (1962) was the first to use the term "benign senescent forgetfulness" to

describe such memory complaints. Kral noted that most older persons with complaints of forgetfulness, but without severe memory deficit, have a benign prognosis. Similarly, Reisberg and Ferris (1982) reported a study of 17 independent living older persons (mean age = 68.5) who complained of forgetting names and where objects had been placed, but did not demonstrate evidence of significant deficit on formal memory tests. At follow up, an average of 27 months later, none showed worsened health or cognitive functioning. Much research has been focused on memory in the older adult. This research (Poon, 1985) has clearly shown that secondary, or long term memory functioning changes with normal aging.

One reason for the difficulty of differentiating dementia from depression is that cognitive difficulty frequently accompanies depression in the elderly, and can be of sufficient severity to be confused with dementia (Kaszniak, 1987). Memory complaint and memory deficit exists in depression. Research and clinical experience have suggested that older depressed patients frequently complain of memory difficulty, even when objective assessment of memory fails to document deficit (Kahn, Zarit, Hilbert, and Niederehe, 1975). Kahn and colleagues speculated that this discrepancy between memory complaint and memory performance in older depressed patients may reflect a general tendency toward pessimistic self-assessment. Larrabee and Levin (1986), found that among volunteer samples of normal elderly persons, self-ratings of memory abilities may be more related to self-rated depression than to objective memory test performance.

Concomitant with increased memory complaint and adding to the diagnostic difficulty, research documents the presence of memory deficit, as well as other cognitive difficulties among many depressed patients (Caine, 1986; McAllister, 1981; W.R. Miller, 1975). It further is possible that such cognitive deficits manifest more in older, as compared to younger, depressed patients, although empirical support for this possibility has been mixed (Niederehe, 1986). These deficits have been shown to be reversible, following successful treatment of the depression, with the degree of memory improvement being correlated with the degree of resolution of depression (Sternberg and Jarvik, 1976; Stromgren, 1977). Although memory is not the only cognitive function impaired in depression, it has been one of the most frequently researched areas of deficit (McAllister, 1981).

Kaszniak (1987) suggests that difficulty in differentiating dementia from depression may include the following: (1) the occurrence of depression coexisting with a dementing illness, and (2) the resemblance of certain features of dementing illnesses to those of depression.

Several authors (e.g., Kaszniak, 1986; McAllister and Price, 1982; N. E. Miller, 1980) have recently drawn attention to the occurrence of coexisting depression and cognitive deficit in Alzheimer's Disease (AD). Coexistent depression in AD complicates diagnosis. The importance of diagnosing depression in AD is emphasized by the occurrence of suicide attempts in these patients (Post, 1962) as well as indirect self-destructive behavior (Demuth and Rand, 1980).

Although some authors (Busse, 1975; Pfeiffer, 1977) have suggested that depressive symptoms are most common in the early stages

of dementia, others (e.g., Demuth and Rand, 1980) have reported depression to exist in patients with severe dementia. Likewise, within studies of a larger series of patients, some (Reifler, Larson, and Hanley, 1982) have found the prevalence of coexisting depression to decrease significantly with greater severity of cognitive impairment. Others (Kaszniak, 1985; Kaszniak, Wilson, Lazarus, Lessor, and Fox, 1981) fail to find any significant relationship between severity of depressive symptoms and severity of cognitive impairment. At present it appears that depressive symptoms can occur at any point in the course of dementia (Kaszniak, 1986). With the similar symptomatology that exists between depression and dementia, the problem of differential diagnosis, as well as accurately diagnosing concurrent disorders, is increased.

Kaszniak (1987) observed that relatively little systematic research has focused upon the nature of depression in AD. Available research suggests different approaches to the assessment of depression may yield different results (N.E. Miller, 1980; Kaszniak, 1985). Self-report measures appear to give different estimates of the presence and severity of depression in dementia than do examiner-administered or observation-based instruments. Such discrepancies likely reflect the difficulties in insight and self-report frequently manifested by dementia patients.

A final difficulty in attempting to diagnose coexistent depression in AD is produced by the similarity of certain features of dementia to depression (Kaszniak, 1987). For example, the dementia patient may be careless in personal grooming, suggesting the

possibility of depression-related apathy. A lack of different facial expressions in dementia may be interpreted as the loss of interest or pleasure often seen in depression. For some clinicians, a tendency toward such interpretation may be increased by the desire to find a treatable disorder, such as depression, in the dementia patient (Mortsyn, Hachanadel, Kaplan, and Gutheil, 1982).

Diagnostic Specification Problems in Previous Research

Although it has frequently been reported that elderly individuals with dementia obtain lower scores than do age-matched depressed or normal persons on most tests of cognitive function, there are a number of methodological problems characteristic of this literature (La Rue, Dessonville, and Jarvik, 1985). Most investigations have compared general "organic" and "depressed" patient groups, and as a result, provide no information about the patterns of performance observed with more specific disorders such as primary degenerative (or Alzheimer-type) dementia.

Theoretical Distinctions Among Memory Processes

Correctly differentiating dementia from depression is extremely important; many forms of dementia are chronic, carry a poor prognosis, and are associated with therapeutic nihilism, whereas depression is a highly treatable disorder. Aspects of memory task performance, as described below, may help to differentiate dementia from depression. Memory has also been the most researched cognitive dimension in geropsychology as noted earlier. The clinician interested in

differential diagnosis thus needs a theoretical and practical understanding of memory functioning in normal and pathological aging.

In studying memory processes, the most frequently employed paradigms are those employing information processing models of memory. Information processing models are based upon three basic assumptions: (1) that humans actively participate in learning and information retrieval, (2) that responses can be analyzed quantitatively and qualitatively, and (3) that information flow can be traced through a number of hypothetical memory processes (Kaszniak, Poon, and Reige, 1986).

Until recently, a "linear" model of information processing has dominated memory research. This model assumes that information flows from input to output through a series of sequential stages, or memory stores. At the very early stage of information registration is sensory memory, a preattentive and highly unstable system characterized by rapid decay of information representation. Perceptual (pattern recognition) and attentional processes serve to transfer information out of sensory stores and into the next stage. This next stage involves the divisions of primary (short term) and secondary (long term) memory (Waugh and Norman, 1965), which are responsible for the acquisition and retention of new information. Primary memory (PM) is thought of as a limited-capacity store in which information is still "in consciousness" as it is being used. The process of rehearsal is postulated to transfer information from primary to secondary memory (SM) (Murdock, 1967). It has been assumed that if the information is not rehearsed instantly, so that it can be stored in secondary memory, it will be lost (Bayles and Kaszniak, 1987).

Within the linear information processing model, memory failures are attributed to a variety of factors that include: (1) reduced capacity of the hypothetical stores, particularly the short term store, (2) a decay, or "forgetting," of information from one or more stores, (3) a failure of the transfer processes (i.e., pattern recognition, attention, rehearsal) in which information is moved from one store to the next, and (4) a combination of these factors. If there is difficulty at any stage of the sequence, memory performance will suffer (Atkinson and Shiffrin, 1971; Kaszniak, Poon and Reige, 1986). In addition to these stages or stores, several other interacting dimensions are hypothesized. One such dimension consists of dynamic processes related to the encoding, storage, and retrieval of information. Another dimension defines the modality-specificity (e.g., auditory, visual, olfactory) or other properties (e.g., verbal, spatial) of the incoming information. The functioning of any or all of these multiple dimensions of memory is affected by differences in intelligence, education, and socioeconomic status, as well as neurologic, hormonal, and physiologic states. Thus, given the many factors that can influence memory, it is clear that the level of functional memory is fluid and subject to both intra-and interpersonal variability (Kaszniak, Poon, and Reige, 1986). This explains why memory performance fluctuates somewhat, from one examination to the next, in both healthy and ill individuals.

Memory and Normal Aging

The research conducted on normal aged individuals indicates that secondary memory encoding and retrieval processes decline with normal aging (Kaszniak, Poon, and Reige, 1986). Thus, the healthy older person

will appear able to briefly retain new information with accuracy, but may complain of difficulty retrieving the information at some later time.

The linear information processing approach to the study of memory and normal aging has produced a large body of research, leading to the following general conclusions: (1) speed and accuracy of recall from primary memory show little, if any, age group differences, provided that information load does not exceed the hypothetical capacity of this store, (2) there is an age-related slowing of retrieval from secondary memory, (3) secondary memory accuracy shows relatively large age-group differences, and (4) older adults are deficient in secondary memory encoding and retrieval processes, but not in storage (Kaszniak, Poon, and Riege, 1986; Poon, 1985).

Craik (1984) suggested that there are age related decrements in memory functioning, but that these impairments are more apparent in some tasks than in others. Craik suggested that decrements often appear to reflect "inefficient functioning" rather than a "true breakage" or "loss" of component structures. Thus age differences are minimal in situations characterized by strong stimulus-response connections (those involved in simple sensory-motor functions) or where the processes required are highly practiced and well learned. On the other hand, age differences are greatest when the task requires processing "beyond the information given" - where processes must be self-initiated and not driven by the stimulus, where new connections or patterns must be formed (little reliance on existing schemas) and/or where the person must respond in a manner outside of habitual "sets" of responding.

Thus, Craik (1984) pointed out that large age differences were found in free learning situations (using new or unfamiliar material), as well as in unstructured free recall situations (Craik, 1977), inference demanding situations (Cohen, 1979), and in situations demanding new approaches to problem solving tasks (Rabbitt, 1977).

Hasher and Zacks (1979) pointed out that active information modification require more effort and more cognitive resources. These effortful mental operations appear to be ones that older people are unable, or unwilling to perform. Craik further posited that age differences may or may not appear in either short term or long term retention as a function of "the types of task" being performed, and not the "memory store" in question. Craik (1984) reported that within short term retention, there exist two types of memory tasks: primary memory tasks are those that refer to situations in which small amounts of information must be held briefly in memory and are then retrieved in an unmanipulated fashion. Examples of primary memory tasks include digit span, and recalling the last few words from a free recall list (recency effect). Age differences are negligible on such tasks (Craik, 1984). In contrast, working memory tasks show large age differences (Craik, 1984). Working memory is described by Craik to refer to those situations in which the subject must hold, manipulate, and transform the material in various dual task situations. All require active manipulation and integration of the material and all show large age decrements. Craik (1984) concluded that age decrements appear in short term memory as a function of the amount of active manipulation involved, and not as a result of an impaired memory system.

Craik (1984) used Tulving's (1972) distinction between "semantic" memory referring to a person's store of general knowledge and rules, versus "episodic" memory, referring to contextually relevant events whose time and place of occurrence are part of the information to be remembered. Craik (1984) reviewed literature in support of the position that age decrements appear in both types of memories as a function of the amount of active and novel (i.e., effortful) manipulation required by the task, not merely as a function of the hypothetical memory system involved. Semantic memory tasks that involve practiced routines and/or are guided by the test situation do not generally demonstrate age decrements. Conversely, in episodic memory tasks, those that do not provide much guidance or cues for encoding show marked age decrements (free recall after presentation of a list). However, when a free recall task is paired with instructions that permit the use of semantic or schematic cues (recognition task), no age differences are found (Craik, 1977). Craik (1984) concludes that older adults have fewer "processing resources" from which to coordinate mental operations. If this is the case, those tasks requiring novel or effortful and active manipulation of material would suffer the most.

Memory and Dementia

While considerable evidence (Botwinick, 1973) suggests that memory processes play a central role in many of the behavioral changes that take place with advancing age, such changes may also be pathognomic of underlying disease. Memory deficit in Alzheimers Disease (AD) has been shown to differ from memory change in normal aging along two major dimensions.

First, AD patients show abnormally rapid forgetting of information stored in episodic memory; memory for events (Bayles and Kaszniak, 1987). In this respect, AD patients are similar to amnesic patients with medial temporal lobe cerebral damage. Second, much of the severity of episodic memory deficit in AD appears to be due to deterioration in the access to, and possibly the structure of semantic memory; memory for concepts. In this respect, AD patients are different from most patients with amnesia due to focal cerebral damage (Bayles and Kaszniak, 1987). The clinical importance of these claims is primarily in implications for assessment. The abnormally rapid forgetting of events in AD suggests that clinical assessment of episodic memory should include instruments that allow the measurement of information loss over time. Further, the differentiation of AD from normal aging, as well as various amnesic disorders, will be heavily dependent upon the inclusion of instruments to assess aspects of semantic memory (Bayles and Kaszniak, 1987).

Inability to recall recent events is frequently amongst the first signs of a developing dementia and as the condition advances may become one of the most prominent features (Gibson, 1981). In dementia of the Alzheimer type (DAT), disordered memory is the first and most prominent symptom (E. Miller, 1977; Sjogren, Sjogren, and Lindgren, 1953). In dementia patients, there exists a greater deficit in SM than in PM (Wilson, Bacon, Fox, and Kaszniak, 1983). Although DAT patients exhibit a greater deficit on SM as compared to PM measures, there are two reasons why one must be cautious in accepting any clear PM-SM dissociation in DAT. First, the PM and SM measures are correlated in

the dementia sample. Second, analysis of recall by input/output position in PM indicates that the patient's deficit emerges early, after only three intervening items, well before Tulving and Colotla's (1970) cutoff point between PM and SM. The relatively normal PM functioning in most forms of amnesia makes it possible to examine the SM deficit with some assurance that patients are adequately attending to the to-be-remembered material. There is no assurance of this for DAT. Rather, results suggest that DAT patients are inattentive, and that their inability to recall information is at least partially due to this factor (Wilson, Bacon, Fox and Kaszniak, 1983).

The lack of evidence of proactive interference (material previously learned interfering with the learning of new material) is consistent with this view. Unlike controls, the DAT patients show no trend toward decreased SM recall over lists. Further, a double dissociation is observed in the analysis of intrusions. Controls' intrusions are predominantly prior-items; the DAT patient's intrusions are predominantly extra list items (Wilson, Bacon, Fox, and Kaszniak, 1983).

It has been hypothesized that the lack of evidence for proactive interference on a free recall task, as well as the dearth of SM recall, both reflect, in part, an initial processing failure - perhaps, an inability to attend adequately to incoming information (Wilson, Bacon, Fox, Kramer and Kaszniak, 1983). The SM deficit of DAT patients may thus be partially due to a PM deficit. That is, limited PM capacity and processing may place limits on input available for SM processing. DAT patients exhibit multiple deficits in processing to-be-remembered

information, and these deficits seem to occur early rather than late in the information flow (Wilson, Bacon, Fox, Kramer, and Kaszniak, 1983).

Memory and Intelligence and Depression

Memory impairments are also present in depression, and this presents difficulties in differential diagnosis. Kendrick and Post (1967) first quantified this with respect to the elderly. They found that a small proportion of elderly depressed patients showed deficits on a verbal memory test (The Synonym Learning Test) severe enough to be suggestive of a dementia. All other evidence, however, was against this diagnosis, and the deficits improved as the depression remitted.

The presence of reversible cognitive deficits in depression, particularly in the elderly, contributes to the problems in the interpretation of formal tests of intellect, memory, and other cognitive assessment instruments. Whitehead (1973), in comparing elderly patients with depression versus those with dementia found the brain-damaged patients to score at generally lower levels on the Wechsler Adult Intelligence Scale (Wechsler, 1958) than the depressed patients. However, there was no evidence that the patterns of scores were related to diagnosis. Similar subtests of the WAIS were impaired, in comparison to normative expectation, for both groups. Thus, particularly when impairment is quantitatively mild, great caution needs to be exercised in the interpretation of WAIS performance.

Qualitative Aspects of Memory in Depression and Dementia

Thus, although severity and pattern of measured intellectual deficit will not reliably differentiate depressed from demented patients, recent research on the qualitative aspects of memory deficit does provide some assistance. One qualitative dimension, upon which older patients with depression and dementia differ, involves response bias. In general, studies have indicated that elderly depressed patients adopt a more conservative response strategy than older dementia patients (Larner, 1977; Miller and Lewis, 1977). The older depressed patients made fewer false-positive memory errors (identifying an item as having been presented when it really was not), but also showed fewer true-positive (correctly identifying a stimulus as having been presented before) responses than dementia patients. It thus appears that response bias, rather than true memory disorder, is at fault in the poor memory performance of the elderly depressed patient. Other, more recent research has provided additional evidence in support of this conclusion. Gibson (1981) employed an information processing analysis (allowing for differential assessment of the theoretically distinct processes of primary and secondary memory) of free recall in a word list learning task. Results suggested that, in dementia, there is a fundamental breakdown in the process of memory itself, whereas among the elderly depressed there is a suppression of normal memory process. That is, the depressed elderly produced serial position curves with the same shape as normals, albeit at a lower level, but the dementia subjects produced different curves. In particular, the dementia group displayed a severe

loss of items presented early in the series (or a loss of primacy effect). The depressed are qualitatively similar to the normals and may be suppressing a relatively normal memory process.

The evidence for response bias in the memory performance of older depressed patients does suggest that qualitative analysis of memory and other cognitive abilities would be of clinical utility. Kaszniak, Sadeh and Stern (1985), as well as others (Wells, 1979) have noted that older depressed patients who manifest apparent cognitive deficits frequently give "don't know" answers in intelligence or memory assessment (suggesting conservative response bias), whereas dementia patients show fewer such responses and typically make several "near miss" errors or manifest obvious guessing.

A second qualitative aspect of memory performance in depressed patients that may be helpful in differentiating depression from dementia, involves the hypothetical cognitive processes of arousal, attention, concentration, and motivation. Research by Weingartner and colleagues (Weingartner, Cohen, Murphy, Mortello, and Gerdt, 1981; Weingartner, 1986) has indicated that depressed patients experience their greatest difficulty in memory tasks that require elaborate or "effortful" (Hasher and Zacks, 1979) organization and processing of materials to be remembered. In contrast, dementia patients appear to have difficulty in all memory tasks, including those in which "automatic" (Hasher and Zacks, 1979) memory encoding is presumed to be involved (Weingartner, 1986). Further, Weingartner (1986) finds that degree of memory difficulty in "effortful" processing memory tasks is correlated with Hamilton Depression Rating Scale (Hamilton, 1960) and

Beck Depression Inventory scores (Beck et. al, 1961). The memory performance of depressed patients was also found to correlate with ability to sustain effort in squeezing a hand dynamometer (presumably indexing effort and fatigability) (Weingartner, 1986). Weingartner, et al., (1981) have speculated that disruption of arousal and activation in depression may thus contribute to apparent memory difficulty. This may also explain the clinical observations (e.g., Wells, 1979) that elderly depressed patients with apparent cognitive dysfunction, frequently demonstrate little effort to perform even simple cognitive tasks, appear to give up easily, and frequently show marked variability in performance on tasks of presumably similar difficulty. These qualitative features of memory performance have been suggested to be of clinical utility in differentiating depression from dementia (the dementia patient typically appears to struggle to perform tasks and demonstrates relatively consistent poor performance on tasks of similar difficulty) (Kaszniak et al., 1985).

Many of the recall failures of dementia patients persist, in spite of reminders (e.g., Fuld, 1980), and proactive interference is negligible (Wilson, et al., 1983). In addition, reorganization of lists to maximize semantic encoding does little to improve their performance (Weingartner et al., 1981; Weingartner, Grafman, Boutelle, Kaye, and Martin, 1983), and other mnemonic aids may be ineffective as well (e.g., Butters, 1984). These secondary memory deficits may be accompanied by a reduction in primary memory (Wilson, Bacon, Fox, and Kaszniak, 1983) and in the ability to retrieve information from common, well-defined categories (e.g., Rosen, 1980; Weingartner, et al., 1981). The breadth

and intractability of Alzheimer patients' memory deficits stand in contrast to those of depressed and normal elderly whose memory difficulties tend to be more circumscribed and responsive to procedures designed to enhance encoding or retrieval (La Rue, D'Elia, Clark, Spar, and Jarvik, 1986).

Types of errors. Errors of commission observed during the course of testing may provide an additional basis for diagnostic differentiation. Fuld, Katzman, Davies, and Terry (1982) found an association between intrusion errors (defined as delayed perseveration) and Alzheimer-type brain changes (senile plaques and reduced choline acetyltransferase) in a pathologically verified sample of AD patients. Whitehead (1973) reported that senile dementia patients made more random errors (i.e., irrelevant or extra-list responses) during paired-associate learning than did elderly depressives, even when overall levels of performance were comparable. Further, Irving, Orbinson and McAdam (1971), and Whitehead (1973) have shown evidence that the verbal learning deficit in depressed elderly is not only less severe but also more circumscribed than that found in dementia patients. Outside the rote learning paradigm, depressed subjects have demonstrated normal capacity for span of immediate recall, and reproduction of a story, immediately or after a half hour delay (Whitehead, 1973). The pseudodementia patient, however, may perform such tasks at levels similar to a dementia population. Results need to be inspected qualitatively as well as quantitatively. By interpreting only the quantitative result, one can be inappropriately led to a diagnosis of dementia. Hence, although memory loss in the pseudodementia patient may

appear as severe as the deficit in an AD patient, the causes of the memory loss are distinct (e.g., motivational deficit in the former versus a breakdown in the memory process in the latter).

Differential Shape of Serial-Position Curve

Gibson (1981) studied the qualitative differences of memory loss between dementia patients and depressed subjects by examining serial position curves obtained from a free verbal recall task. Interpretation of the serial position curve (Glanzer and Cunitz, 1966) suggests that the elevated frequency of recall of the last few items presented (recency effect) is due to these items being directly retrieved from short term memory. Likewise, the increased frequency of words recall from the beginning of the list (primacy effect) is due to registration and retrieval from long term memory. The serial position curve thus illustrates the subject's ability to recall presented words from both their short term and long term memories.

Gibson (1981) found that only the dementia patients suffered a demonstratable impairment. The depressed were not different from normals with their serial position curves. Gibson predicted that as depressed patients improve clinically there should also be improvements in their overall level of recall, without change in the shapes of their serial position curves. He found no significant changes at a six month re-evaluation period. In dementia, Gibson argues the memory impairment is the result of a much more fundamental breakdown of the process of memorization.

Possible Causes of Poor Memory in Depression

Depressed persons presenting with memory deficits may have poor memories for a number of reasons that are unrelated to the particular memory processes involved, and which have not been excluded in previous research. For example, depressives may be so preoccupied with their gloomy thoughts that they fail to attend adequately and so do not register the to-be-remembered stimuli. Another possibility, as previously reviewed, is that depressives may remember with normal facility but adopt a much more conservative response strategy. The depressed thus require a higher level of internal certainty before responding and this may lead to poor scores on memory tests (Miller and Lewis, 1977).

Memory capacity versus decision strategy. The distinction between memory capacity and decision strategy can be operationally made by the application of signal detection analysis to recognition memory task data. Signal detection analysis operates within recognition memory tasks that can be operationally made by the application of signal detection analysis to recognition memory tasks that present subjects with either an item previously seen by the subject (target) or one that was not previously seen by the subject (alternative). The subject's task is to respond with a "yes-no" answer based upon whether they had seen the stimuli before or not, and to rate their confidence in this decision. Signal detection analysis thus produces a measure of the subject's ability to discriminate between classes of events as well as motivational or response bias effects. The subject's ability to discriminate a "target stimulus" from a "distractor or alternative

stimulus" is a measure of their discrimination ability or d' . The subject may respond with a conservative or liberal response strategy. These are examples of the subject's response bias or d' . Using this method, Miller and Lewis (1977) predicted that elderly depressives would not differ from normal controls in discrimination ability (d'), and that both normals and depressed would show superior discrimination ability compared to dementia subjects. With response strategy, the depressed were expected to be more conservative than either the dementia subjects or control subjects. Miller and Lewis found clear differences among their three groups, in both memory efficiency and willingness to guess. Consistent with their predictions, depressives exhibited stricter decision criteria, indicating an extremely low willingness to guess. The high cautiousness may be associated with lowered motivation or lack of effortful processing, often characteristic of depression (Weingartner, 1986). In addition, guessing and being wrong could be perceived by the subject as being aversive, which would link with those theorists who have alleged that depressives are unusually sensitive to aversive stimuli (e.g., Lewinsohn, Lobitz, and Wilson, 1973). The finding in the Miller and Lewis (1977) study that depressed subjects discriminate target items from alternative items in a similar way to normals, supports the view that poor performance by depressed on memory tasks is not a consequence of true memory deficit.

The Miller and Lewis (1977) study also confirms the strong evidence for dementia subjects having a widespread memory deficit that disrupts performance on most memory tasks. Dementia subjects show marked deficiencies in discrimination ability (d') on the recognition

memory task, when compared to normal and depressed subjects. No significant difference was found between the decision criteria used by the dementia subjects and the controls. This may be partly due to the high level of variation of the decision approaches used by the dementia subject. Dementia subjects were prone to make both false positive (recognition of words not previously presented) and false negative (failure to recognize words previously presented) types of errors.

Besides further illuminating the nature of poor performance on memory tasks in both depression and dementia, Miller and Lewis draw two general implications. First, depression has been associated with impairments in a number of psychological functions (e.g., Miller, 1975). The factors (motivation, cautiousness, effort, etc.) that might cause altered decision processes, among the depressed subjects in the Miller and Lewis study, probably also operate when the depressed patient performs other cognitive tasks. The second general implication relates to the clinical use of memory tests to distinguish between depression and dementia. The design of tests to assess recognition memory might allow distinction to be made between those who perform badly because of poor memory and those who perform badly because of altered decision processes, a distinction that might enhance diagnostic efficiency (Miller and Lewis, 1977).

REFERENCES

- American Psychiatric Association. (1980). Diagnostic and statistical manual of mental disorders (3rd ed.). Washington, D.C: Author.
- Atkinson, R. C., & Shiffrin, R. M. (1971). The control of short term memory. Scientific American, 225, 82-90.
- Bayles, K., & Kaszniak, A. W. (1987). Communication and cognition in normal aging and dementia. Boston: College Hill/Little Brown.
- Beck, A.T. (1972). Depression: Causes and treatment. Philadelphia: University of Pennsylvania Press.
- Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. Archives of General Psychiatry, 4, 561-571.
- Botwinick, J. (1973). Aging and Behavior: A comprehensive integration of research findings. New York: Springer.
- Brinkman, S. D., Largent, J. W., Gerganoff, S., & Pomara, M. (1983). Russell's revised memory scale in the evaluation of dementia. Journal of Clinical Psychology, 39, 989-993.
- Busse, E. W. (1975). Aging and psychiatric diseases of late life. In S. Arieti (Ed.), American handbook of psychiatry, (2nd edition), Volume IV: Organic disorders and psychometric medicine (pp. 67-89). New York: Basic Books.
- Butters, N. (1984). The clinical aspects of memory disorders: Contributions from experimental studies of amnesia and dementia. Journal of Clinical Neuropsychology, 6, 17-36.
- Caine, E. D. (1986). The neuropsychology of depression: The pseudodementia syndrome. In I. Grant & K. M. Adams (Eds.), Neuropsychological assesment of neuropsychiatric disorders. (pp. 221-243). New York: Oxford.
- Christian, J., Bickley, W., Tarko, M., & Clayton, K. (1978). Measures of free recall of 900 English nouns: Correlates with imagery, correctness, meaningfulness, and frequency. Memory and Cognition, 6, 379-390.
- Cohen, G. (1979). Language comprehension in old age. Cognitive Psychology, 11, 412-429.

- Craik, F. I. M. (1977). Age differences in human memory. In J.E. Birren and K.W. Schale (Eds.), Handbook of the psychology of aging (pp. 384-420). New York: Van Nostrand Reinhold.
- Craik, F. I. M. (1984). Age differences in remembering. In L. Squire and N. Butters (Eds.), Neuropsychology of memory (pp. 3-12). New York: The Guilford Press.
- Demuth, G. W., & Rand, B. S. (1980). Atypical major depression in a patient with severe primary degenerative dementia. American Journal of Psychiatry, 137, 1609-1610.
- Diesfeldt, H. F. A. (1978). The distinction between long term and short term memory in senile dementia: An analysis of free recall and delayed recognition. Neuropsychology, 16, 115-119.
- Donnelly, E. F., Waldman, I. N., Murphy, D. L., Wyatt, R. J., & Goodwin, F. K. (1980). Primary affective disorder: Thought disorder in depression. Journal of Abnormal Psychology, 189, 315-319.
- Duckworth, G. S., & Ross, H. (1975). Diagnostic differences in psychogeriatric patients in Toronto, New York, and London. Canadian Medical Association Journal, 112, 847-851.
- Fuld, P. A. (1980). Guaranteed stimulus processing in the evaluation of memory and learning. Cortex, 16, 225-271.
- Fuld, P. A., Katzman, R., Davies, P., & Terry, R. O. (1982). Intrusions as a sign of Alzheimer dementia: Clinical and pathological verification. Annals of Neurology, 11, 155-159.
- Garcia, C. P., Reding, M. J., & Blass, J. P. (1981). Overdiagnosis of dementia. Journal of the American Geriatrics Society, 29, 407-410.
- Gibson, A. J. (1981). A further analysis of memory loss in dementia and depression in the elderly. British Journal of Clinical Psychology, 20, 179-185.
- Glanzer, M., & Cunitz, A.R. (1966). Two storage mechanisms in free recall. Journal of Verbal Learning and Verbal Behavior, 5, 351-360.
- Hachinski, V. C., Lassen, N. A., & Marshall, J. (1974). Multi-infarct dementia: A cause of mental deterioration in the elderly. Lancet, 2, 207-210.
- Hamilton, M. A. (1960). A rating scale for depression. Journal of Neurology, Neurosurgery, and Psychiatry, 23, 56-62.

- Hasher, L., & Zacks, R. T. (1979). Automatic and effortful processing in memory. Journal of Experimental Psychology: General, 108, 356-388.
- Haward, L. (1977). Cognition in dementia presinilis. In W. Smith & M. Kinsbourne (Eds.), Aging and Dementia (pp. 189-202). New York: Spectrum Publications.
- Heston, L. L., & Mastri, A. R. (1982). Age at onset of Pick's and Alzheimer's dementia: Implications for diagnosis and research. Journal of Gerontology, 37, 422-424.
- Irving, G., Orbinson, R. A., & McAdam, W. (1971). The validity of some cognitive tests in the diagnosis of dementia. British Journal of Psychiatry, 117, 149-156.
- Kahn, R. L., Zarit, S. H., Hilbert, N. M., & Niederehe, G. (1975). Memory complaint and impairment in the aged. Archives of General Psychiatry, 32, 1569-1573.
- Kaszniak, A. W. (1985). Personality and emotional change in dementia of the Alzheimer's type: Issues in the investigation of individual differences. Journal of Clinical and Experimental Neuropsychology, 7, 611.
- Kaszniak, A. W. (1986). The neuropsychology of dementia. In I. Grant & K. M. Adams (Eds.), Neuropsychological assessment of neuropsychiatric disorders (pp. 172-220). New York: Oxford.
- Kaszniak, A. W. (1987). Neuropsychological consultation to geriatricians: Issues in the assessment of memory complaints. The Clinical Neuropsychologist, 1, 35-46.
- Kaszniak, A. W., Garron, D. C., & Fox, J. H. (1979). Differential effects of age and cerebral atrophy upon span of immediate recall and paired-associate learning in older patients suspected of dementia. Cortex, 15 288-295.
- Kaszniak, A. W., Poon, L. W., & Reige, W. (1986). Assessing memory deficits: An information processing approach. In L. W. Poon, B. J. Gurland, C. Eisdorfer, T. Crook, L. N. Thompson, A. W. Kaszniak, & K. Davis (Eds.), Handbook for Clinical Memory Assessment of the Older Adults (pp. 168-188). Washington, D.C.: American Psychological Association.
- Kaszniak, A. W., Sadeh, M., & Stern, L. Z. (1985). Differentiating depression from organic brain syndromes in older age. In G. M. Chaison-Stewart (Ed.), Depression in the elderly: An interdisciplinary approach (pp. 161-189). New York: Wiley.

- Kaszniak, A. W., Wilson, R. S., Lazarus, L., Lessor, J. & Fox, J. H. (1981, February). Memory and depression in dementia. Paper presented at the Ninth Annual Meeting of the International Neuropsychological Society, Atlanta, GA.
- Kendrick, D. C., & Post, F. (1967). Differences in cognitive status between healthy, psychiatrically ill, and diffusely brain-damaged elderly subjects. British Journal of Psychiatry, 113, 75-81.
- Kiloh, G. (1961). Pseudo-dementia. Acta Psychiatrica Scandinavica, 37, 336-351.
- Kral, V. A. (1962). Senescent forgetfulness, benign and malignant. Canadian Medical Association Journal, 86, 257-260.
- Larner, S. (1977). Encoding in senile dementia and elderly depressives: A preliminary study. British Journal of Social and Clinical Psychology, 16, 379-390.
- Larrabee, G. J., & Levin, H. S. (1986). Memory self-ratings and objective test performance in a normal elderly sample. Journal of Clinical and Experimental Neuropsychology, 8, 275-284.
- LaRue, A., Dessonville, C., & Jarvik, L. F. (1985). Aging and mental disorders. In J. E. Birren & K. W. Schaie (Eds.), Handbook of the Psychology of Aging (pp. 664-702). New York: Van Nostrand Reinhold.
- LaRue, A., D'Elia, L. F., Clark, E. O., Spar, J. E., & Jarvik, L. F. (1986). Clinical tests of memory in dementia, depression, and healthy aging. Psychology and Aging, 1, 69-77.
- Lewinsohn, D. M., Lobitz, W. C., & Wilson, S. (1973). Sensitivity of depressed individuals to aversive stimuli. Journal of Abnormal Psychology, 81, 259-263.
- Logue, P., & Wyrick, L. (1979). Initial validation of Russell's revised Wechsler Memory Scale: A comparison of normal aging versus dementia. Journal of Consulting and Clinical Psychology, 47, 176-178.
- Madden, J. J., Luhan, J. A., & Kaplan, L. A. (1952). Nondementing psychoses in older persons. Journal of the American Medical Association, 150, 1567-1570.
- Marsden, C. D., & Harrison, M. G. (1972). Outcome of investigation of patients with presenile dementia. British Medical Journal, 2, 249-252.

- McAllister, T. W. (1981). Cognitive functioning in the affective disorders. Comprehensive Psychiatry, 22, 572-586.
- McAllister, T. W., & Price, T. R. P. (1982). Severe depressive pseudodementia with and without dementia. American Journal of Psychiatry, 139, 626-629.
- McCartney, J. R. (1986). Physician's assessment of cognitive capacity: Failure to meet the needs of the elderly. Archives of Internal Medicine, 146, 177-178.
- McKham, G., Drachman, D., Folstein, M., Katzman, R., Price, D., & Stadlan, E. M. (1984). Clinical diagnosis of Alzheimer's disease: Report of the NINCDS-ADRDA work group under the auspices of the Department of Health and Human Services Task Force on Alzheimer's Disease. Neurology, 34, 939-944.
- Miller, E. (1971). On the nature of memory disorder in presenile dementia. Neuropsychologica, 9, 75-78.
- Miller, E. (1977). Abnormal Aging: The psychology of senile and presenile dementia. New York: John Wiley.
- Miller, E., & Lewis, P. (1977). Recognition memory in elderly patients with depression and dementia: A signal detection analysis. Journal of Abnormal Psychology, 86, 84-86.
- Miller, N. E. (1980). The measurement of mood in senile brain disease: Examiner ratings and self-reports. In J. O. Cole & J. E. Barrett (Eds.), Psychopathology in the Aged (pp. 97-122). New York: Raven.
- Miller, W. R., (1975). Psychological deficit in depression. Psychological Bulletin, 82, 238-260.
- Mortsyn, R., Hachanadel, G., Kaplan, E., & Gutheil, T. G. (1982). Depression versus pseudodepression in dementia. Journal of Clinical Psychiatry, 43, 197-201.
- Moscovitch, M. (1982). Multiple dissociation of function in amnesia. In L. S. Cermak (Ed.), Human memory and amnesia (pp. 337-370). Hillsdale, N.J.: Lawrence Erlbaum.
- Murdock, B. B. (1967). Recent developments in short term memory. British Journal of Psychiatry, 58, 421-433.
- National Institute on Aging Task Force. (1980). Senility reconsidered: Treatment possibilities for mental impairment in the elderly. Journal of the American Medical Association, 244, 259-263.

- Niederehe, G. (1986). Depression and memory impairment in the aged. In L.W. Poon (Ed.), Clinical memory assessment of older adults (pp. 226-237). Washington, DC: American Psychological Association.
- Niederehe, G., & Camp, C.J. (1985). Signal detection analysis of recognition memory in depressed elderly. Experimental Aging Research, 11, 207-213.
- Nott, P., & Fleminger, J. (1975). The difficulties of early diagnosis. Acta Psychiatrica Scandinavica, 51, 210-217.
- Orme, S.E. (1957). Non verbal and verbal performance in normal old age, senile dementia, and elderly depression. Journal of Gerontology, 12, 404-413.
- Pastore, R., & Scheirer, C. (1974). Signal detection theory: Considerations for general application. Psychological Bulletin, 81, 945-958.
- Pfeiffer, E. (1977). Multidimensional functional assessment: The OARS methodology. Durham, N.C.: Duke University Center for the Study of Aging and Human Development.
- Poon, L. W. (1985). Differences in human memory with aging: Nature, causes and clinical implications. In J. E. Birren & K. W. Schaie (Eds.), Handbook of the psychology of aging (pp. 427-462). New York: Van Nostrand Reinhold.
- Post, F. (1962). The significance of affective symptoms in old age. London: Oxford.
- Post, F. (1975). Dementia, depression and pseudodementia. In D. F. Benson & D. Blumer (Eds.), Psychiatric aspects of Neurological Disease (pp. 99-120). New York: Gruner and Stratton.
- Rabbitt, P. M. A. (1977). Changes in problem solving in old age. In J.E. Birren and K.W. Schave (Eds.), Handbook of the psychology of aging (pp. 606-625). New York: Van Nostrand Reinhold.
- Reifler, B. V., Larson, E., & Hanley, R. (1982). Coexistence of cognitive impairment and depression in geriatric outpatients. American Journal of Psychiatry, 139, 623-626.
- Reisberg, B., & Ferris, S. H. (1982). Diagnosis and assessment of the older patient. Hospital and Community Psychiatry, 33, 104-110.
- Rosen, W. G. (1980). Verbal fluency in aging and dementia. Journal of Clinical Neuropsychology, 2, 135-146.

- Sjogren, T., Sjogren, H. J., & Lindgren, A. G. H. (1953). Morbus Alzheimer and morbus Pick: Genetic, clinical and patho-anatomical study. Acta Psychiatrica Scandinavica Supplement, 82, 1-152.
- Sluss, T. K., Rabins, P., Gruenberg, E. M., & Reedman, G. (1980). Memory complaints in community residing men. The Gerontologist, 20, 201.
- Sternberg, D. E., & Jarvik, M. E. (1976). Memory function in depression. Archives of General Psychiatry, 33, 219-228.
- Storandt, M., Botwinick, J., & Danzinger, W. L. (1986). Longitudinal changes: Patients with mild SDAT and match healthy controls. In L. W. Poon (Ed.), Clinical memory assessment of older adults (pp. 277-284). Washington, DC: American Psychological Association.
- Stromgren, L. S. (1977). The influence of depression on memory. Acta Psychiatrica Scandinavica, 56, 109-121.
- Tulving, E. (1972). Episodic and semantic memory. In E. Tulving & W. Donaldson (Eds.), Organization of Memory (pp. 381-403). New York: Academic Press.
- Tulving, E., & Colotla, V. A. (1970). Free recall of tri-lingual lists. Cognitive Psychology, 1, 86-98.
- Watkins, J. J. (1974). Concept and measurement of primary memory. Psychological Bulletin, 81, 695-711.
- Waugh, N. C., & Norman, D. A. (1965). Primary Memory. Psychological Review, 72, 89-104.
- Wechsler, D. (1945). A standardized memory scale for clinical use. Journal of Psychology, 19, 87-95.
- Wechsler, D. (1958). The measurement and appraisal of adult intelligence. Baltimore: Williams and Wilkins.
- Weingartner, H. (1986). Automatic and effort demanding cognitive processes in depression. In L.W. Poon (Ed.), Clinical memory assessment of older adults (pp. 218-225). Washington, DC: American Psychological Association.
- Weingartner, H., Cohen, R. M., Murphy, D. L., Mortello, J. D. I., & Gerdt, C. (1981). Cognitive processes in depression. Archives of General Psychiatry, 38, 42-47.
- Weingartner, H., Grafman, J., Boutelle, W., Kaye, W., & Martin, P. (1983). Forms of memory failure. Science, 221, 380-382.

- Wells, C. G. E. (1979). Pseudodementia. American Journal of Psychiatry, 136, 895-900.
- Whitehead, A. (1973). Verbal learning and memory in elderly depressives. British Journal of Psychiatry, 123, 203-208.
- Whitehead, A. (1974). Factors in the learning deficit of elderly depressives. British Journal of Social and Clinical Psychology, 13, 201-208.
- Wilson, R. W., Bacon, L. D., Fox, J. W., & Kaszniak, A. W. (1983). Primary memory and secondary memory in dementia of the Alzheimer type. Journal of Clinical Neuropsychology, 5, 337-344.
- Wilson, R. S., Bacon, L. D., Fox, J. H., Kramer, R. L., & Kaszniak, A. W. (1983). Word frequency effect and recognition memory in dementia of the Alzheimer type. Journal of Clinical Neuropsychology, 5, 97-104.
- Wilson, R. S., & Kaszniak, A. W. (1986). Longitudinal changes: Progressive idiopathic dementia. In L. W. Poon, B. J. Gurland, C. Eisdorfer, T. Crook, L. N. Thompson, A. W. Kaszniak, and K. Davis (Eds.), The Handbook of Clinical Memory Assessment of Older Adults (pp. 285-293). Washington, D.C.: American Psychological Association.
- Wilson, R. S., Kaszniak, A. W., & Fox, J. H. (1981). Remote memory in senile dementia. Cortex, 17, 41-48.
- Zelinsky, E. M., Gilewski, J. J., & Thompson, L. W. (1980). Do laboratory tests relate to self-assessment of memory ability in the young and old? In L. W. Poon, J. L. Fozard, L. S. Cermak, D. Arenberg, & L. W. Thompson (Eds.), New Directions in Memory and Aging (pp. 519-544). Hillsdale, N.J.: Lawrence Erlbaum Associates.