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Processing strategies and recall performance for narrative passages and word lists of negative and neutral affective valence in depression

Lora L. Sloan

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PROCESSING STRATEGIES AND RECALL PERFORMANCE FOR NARRATIVE
PASSAGES AND WORD LISTS OF NEGATIVE AND NEUTRAL AFFECTIVE
VALENCE IN DEPRESSION

by

Lora L. Sloan
Bachelor of Arts, University of North Dakota, 1990
Master of Arts, University of North Dakota, 1994

A Dissertation

Submitted to the Graduate Faculty

of the

University of North Dakota

In partial fulfillment of requirements

for the degree of

Doctor of Philosophy

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This dissertation, submitted by Lora L. Sloan in partial fulfillment of the requirements for the Degree of Doctor of Philosophy from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

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This dissertation meets the standards for appearance, conforms to the style and format requirements of the Graduate School of the University of North Dakota, and is hereby approved.

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Date

PERMISSION

Title Processing Strategies and Recall Performance for Narrative for
 Passages and Word Lists of Negative and Neutral Affective Valence
 in Depression

Department Psychology

Degree Doctor of Philosophy

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TABLE OF CONTENTS

LIST OF TABLES.....	v
ACKNOWLEDGMENTS.....	vi
ABSTRACT.....	vii
CHAPTER I INTRODUCTION.....	1
CHAPTER II METHOD.....	23
CHAPTER III RESULTS.....	28
CHAPTER IV DISCUSSION.....	35
APPENDICES.....	42
REFERENCES.....	49

LIST OF TABLES

Table		Page
1	Means, Standard Deviations and T-Scores for Age, WAIS-R Vocabulary Scores, and Depression Inventory Scores at Screening and Participation.....	29
2	Mean Proportions of Idea Units Recalled and Standard Deviations for Prose Passages by Group and Passage Type.....	30
3	Mean Proportions of Idea Units Recalled and Standard Deviations as a Function of Affective Valence and Importance Level.....	30
4	Means and Standard Deviations for Reading Times in Seconds by Importance Level.....	32
5	Means and Standard Deviations for Word List Recall by Group and Passage Type.....	33

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ABSTRACT

Depressed individuals have been found to exhibit memory deficits on tasks that require effortful processing. They have also been found to remember negative materials better than their nondepressed cohorts. While these findings are well-documented, there have been few studies designed to examine how and why these differences in recall occur. The present study examined prose passage and word list recall in depressed and nondepressed college students. Processing times and structure of recall were also examined to assist in determining how material was processed and remembered. Half of the passages and word lists utilized were of negative affective valence and half were of neutral affective valence. Subjects were 70 undergraduate students who completed the Beck Depression Inventory (BDI) and Geriatric Depression Scale (GDS) prior to selection and again at the time of participation to ensure stability of mood. Individuals scoring at or above 10 on the BDI and at or above 11 on the GDS during both screening and experimental phases were classified as depressed. Individuals scoring at or below four on the BDI and at or below four on the GDS during both screening and experimental phases were classified as nondepressed. Subjects read narrative passages and word lists from a computer screen. Rate of presentation was controlled by subjects and recorded in milliseconds by the computer. Oral recall was audiotaped immediately after each story or word list. Memory for each passage was expressed as the proportion of idea units recalled at each of three levels of importance. Prose passage recall analyses indicated that depressed subjects remembered more idea units from negative passages than neutral passages and exhibited superior recall to nondepressed subjects for negative word lists. Memory for each word list was expressed as the proportion of idea units

recalled at each of three serial positions. Word list recall results revealed that nondepressed subjects recalled significantly more neutral words than negative words and demonstrated superior recall to depressed subjects for neutral word lists. Structure of recall and processing time did not vary between groups on either task despite differences in memory performance. Results indicated a mood congruent memory bias for both prose passages and word lists. The group exhibiting the mood congruent memory bias changed with task, however. The reason for the difference in the pattern of memory bias between the prose and word list recall tasks is not immediately obvious but may be the result of a differential degree of effortful processing required when processing word lists and prose passages. The implications of these findings in relation to models of cognitive processing in depression are discussed.

CHAPTER I

INTRODUCTION

Background and Significance

Existing studies related to depression and memory have yielded two basic findings, both of which are described in detail with supporting evidence in this chapter. The first major finding in this area is that in comparison to their nondepressed counterparts, depressed subjects exhibit deficits on more complex tasks that require effort and planning such as word list memorization, but not on tasks that utilize more automatic cognitive processes such as estimation of the frequency of events or recall of spatial location (Burt, Zembar & Niderhe, 1995).

The second major finding related to depression and memory is that there appears to be a mood-congruent memory bias that occurs when depressed subjects are asked to recall materials that have negative content. A more specific term to describe how the content of material can be classified in relation to the mood it evokes is "affective valence." Studies suggest that depressed individuals have superior recall for material with negative affective valence and decreased recall for material with positive affective valence when compared to nondepressed individuals (Dalglish and Watts, 1990). Watkins et al. (1992) also supported a mood congruent memory bias but helped refine our understanding of the context of this phenomenon by reporting that it was found to be present only on tasks that required effortful processing.

The most recent review related to depression and memory (Burt, Zembar & Niederhe, 1995) supports both of these major findings and suggests that there is a need for research that illuminates the reasons for these findings. Studies that

increase understanding of the specific changes that lead to impairment in effortful processing, investigate differences in the manner in which materials of various affective valences are processed, and examine differences in the structure of recall, would bridge the gap in knowledge that exists in this area of research.

Understanding depression and the cognitive changes that characterize it has clinical utility in that it may lead to the development of assessment devices that assist with differential diagnoses and supplement subjective report of symptoms provided by individuals with limited insight. Knowledge about cognitive processing in depression may also have implications for the general treatment of depression, especially in the realm of cognitive-behavioral therapy. On a theoretical level, findings of such studies would yield evidence that could be used to support or refute various hypotheses that have been proposed to explain memory deficits in depression.

Specific Aims

The current study was designed to explore depression and memory with prose passages and word lists of neutral and negative affective valence. It attempts to answer questions about the causes and nature of memory impairment in depressed individuals by analyzing the structure of recall and measuring subject-controlled processing times for both passages and word lists. These are techniques that have not been used previously in studies on depression and memory. They are designed to increase understanding of hypothesized processing differences in depressed and nondepressed individuals, which have not been sufficiently investigated.

Literature Review

Differentiation of Depression and Mood Induction

Studies exploring the effects of depressed mood on memory and other cognitive tasks are numerous and generally fall into one of two broad categories. Investigations of the type that are germane to the current study compare participants who are suffering from naturally occurring depression with nondepressed participants on tasks that require recall, recognition, or other types of cognitive processing. Studies of the

second type use experimental manipulation to induce depressed mood and are often called mood induction studies. Mood induction produces a transient affective state while depression is a more stable affective state that has associated symptoms such as appetite and sleep disturbance. While a large number of studies have been done using mood induction techniques, they are not of central importance to the current project and will not be reviewed.

Basic Literature Findings

Recent reviews by Hartlage et al. (1993) and Dalglish & Watts (1990) have provided much needed structure to the vast body of literature that explores how depression leads to changes in memory and cognitive processes. Burt et al. (1995) contributed further to the understanding of this area with a meta-analysis of 99 studies on recall and 48 studies on recognition memory in depressed versus nondepressed individuals. The general conclusion drawn from these studies was that the literature provides sufficient evidence of at least some memory deficits and processing difficulties are associated with depression.

Automatic and Effortful Processing

Recent literature review articles (Hartlage et al., 1993; Dalglish & Watts, 1990) as well as Burt et al.'s 1995 meta-analysis concur that one rather robust finding has been that depressed individuals appear to show deficits on tasks that require effortful processing such as word list memorization but not on tasks that utilize automatic processing such as remembering spatial location or estimating frequency of events. According to Hartlage et al. (1993), nearly all definitions of what constitutes automatic processes specify that the processing occurs without requiring attention, conscious awareness, or intentional control by the individual. In addition, automatic processing takes place in a parallel fashion, without taxing cognitive capacity limitations, or interfering with other operations. In contrast, effortful processing is characterized as more voluntary. Hartlage et al. (1993) suggested that there appears to be agreement that effortful processing occurs serially, requires attention, and is

influenced by cognitive capacity. Furthermore, these processes can be improved with practice and can be used to cause learning.

Smith et al. (1993) demonstrated such performance differences between depressed and nondepressed individuals on tasks requiring automatic and effortful processing. The authors hypothesized that depressed individuals would utilize less sophisticated cognitive strategies not unlike those of the young or developmentally disabled. Two experiments using criterial-attribute (CA) tasks and family resemblance (FR) tasks were used to examine this hypothesis. CA tasks can be characterized as effortful and require deliberate, systematic hypothesis testing. The CA tasks used in these studies required subjects to categorize nonsense words or faces with variable dimensions as belonging to one of two groups. In the first experiment, the presence of a certain letter in a particular position in a series of letters always predicted category membership. In the second study, a particular facial characteristic always indicated to which group the faces belonged. The nature of the tasks required subjects to use a flexible, analytical, effortful processing style to identify the one diagnostic attribute that would allow them to successfully categorize each word or face. The FR categorization tasks used in these studies also required subjects to classify words or faces with variable dimensions. In contrast to the CA tasks, however, successful performance required subjects to use processing strategies that were more holistic and automatic in nature, since there was no particular diagnostic attribute.

Subjects in the first experiment (Smith, 1993) were 135 depressed or nondepressed college students who were categorized as such based on their Beck Depression Inventory (BDI) scores falling above or below the mean of 10.03. The second experiment utilized 131 male subjects who were medical and psychiatric patients at a Veteran's Administration medical center. The mean BDI score was 17.3, and the subjects were divided into three groups with mean scores of 7.3, 20.3, and 33.6 using the Beck and Hurvich (1959) method. This method advocates dividing

subjects into three groups depending on whether their BDI scores are below 15, from 15 to 25, or above 25. Results consistent with the authors' hypothesis were obtained in both experiments. Depressed individuals performed in a way that suggested they had reduced cognitive flexibility (ability to plan and employ strategies) which is needed to analyze information. They therefore used holistic categorization more often than their nondepressed counterparts. The type of processing used by the depressed subjects appeared to be a more implicit, intuitive and nonanalytical, which is considered automatic as opposed to effortful. It should be noted, however, that although these results were described by the authors as indicative of actual processing differences between the depressed and nondepressed groups, the study was not designed to collect data on processing strategies. Hypothesized causes of the documented deficits on effortful cognitive tasks will be explored later in this document as a separate issue.

In another study exploring performance on automatic versus effortful tasks, Channon, Baker, and Robertson (1993) compared clinically depressed subjects with nondepressed subjects on a range of working memory tasks. All subjects were evaluated using a clinical interview. Twenty-four adults who met DSM III-R criteria for Major Depression and 21 adults who did not meet the criteria participated in this study. Because some of the subjects in the depressed group were taking antidepressant medication at the time of the study, analyses were conducted to determine if there were differences in experimental task performance between medicated and nonmedicated group members. No evidence was found to suggest that medication led to differences in performance, however. WAIS-R vocabulary and block design tests were administered to all subjects and scores did not vary significantly between groups.

The Baddley and Hitch (1974) model of working memory was used as a theoretical framework by which to make predictions. This model of working memory hypothesizes that there is a central executive that allocates attentional resources and

mediates decision making and problem solving. Also hypothesized are two subsystems, the visuospatial sketch pad and the articulatory loop. These subsystems carry out more passive processing functions. The articulatory loop is responsible for the temporary phonological storage of information while the visuospatial sketch pad assists in recall of spatial sequences.

The three tasks Channon et al. (1993) used to measure functioning of the articulatory loop in this study included the forward digit span from the WAIS-R, a word length test, and a phonological similarity task. To measure visuospatial sketch pad functioning, Corsi's block sequence span (see Milner, 1971 for details) was used to measure immediate recall of spatial sequences. Both tests of articulatory loop functioning and visuospatial sketch pad functioning are generally believed to require automatic as opposed to effortful processing.

Several tasks involving the central executive (i.e., more effortful processing) were also used. Subjects were given the backward digit span, backward block sequence span, the paced and unpaced auditory serial addition test (PASAT), (Gronwall & Sampson, 1974), a trailmaking task, and letter cancellation task. The backward block sequence span requires the backward recall of spatial sequences. The PASAT is a series of audiotaped digits that subjects are asked to add together as they are presented. Subjects are required to add each new digit to the one immediately preceding it. A trailmaking task requires that subjects use a writing instrument to connect numbers in ascending order and then alternate between letters and numbers. In a letter cancellation task, subjects are asked to cancel out target letters that are presented visually along with distractor letters.

Results of the Channon et al. (1993) study examining task performance of 24 depressed and 21 nondepressed subjects showed the articulatory loop and visuospatial sketch pad components of working memory to be unimpaired in depressed subjects. No significant differences were found between groups on the phonological similarities test, the word length task, or the forward digit span, all of which measure

articulatory loop functioning. In addition, no significant differences were found between groups on the Corsi's block sequence span, which was the measure of visuospatial sketch pad functioning. Depressed subjects did show significant impairment on backward digit span, however, and marginally significant ($p < .06$) deficits on the paced and unpaced auditory serial addition test (PASAT). No significant performance differences on the trail-making test or letter cancellation task, which also measured central executive functioning, were noted, however. So while tasks involving automatic processes were generally shown to be unaffected by depression, impairment on some tasks requiring more effortful processing was noted. Results of this study appear to be only somewhat supportive of the notion that central executive tasks, which involve effortful processing, are impaired in depression.

An example of a study that clearly did not obtain the typical pattern of results in this area is the Rohling and Scogin (1993) project that compared three groups on memory tasks that varied along the automatic and effortful memory encoding continuum as defined by Hasher and Zacks (1979). Subjects in this study (Rohling & Scogin, 1993) were 16-75 years of age, native English speakers, and had a minimum of 8 years of education.

There were three groups that were described as depressed, nondepressed and psychiatric controls. Thirty depressed patients (21 outpatients and nine inpatients) who met DSM III-R criteria for major depression and were receiving treatment for a depressive disorder as identified by a mental health professional were selected. In addition, they were further screened and confirmed as depressed using the Inventory to Diagnose Depression (IDD) and scored 14 or higher on Hamilton Rating Scale for Depression (HRSD). Fourteen were taking psychotropic medication. Mean length of time in psychotherapy was 8.7 weeks. The group of psychiatric controls consisted of various people with a history of psychiatric problems who did not meet criteria for major depression at the time of the study. Some had been previously depressed and some had been diagnosed with other disorders. Of the twenty psychiatric controls,

eight were inpatients and three of those individuals were taking psychotropic medication. Five of the 12 outpatients were taking psychotropic medication. Mean length of time in psychotherapy was 11.2 weeks. The 30 normal controls were matched to depressed subjects with respect to age and years of education. Normal controls had no history of psychiatric dysfunction and were not taking psychoactive medication.

Two effortful tasks were utilized in this study. One was free recall list learning in which subjects read lists of concrete nouns aloud, counted backwards, then gave free recall. The other effortful task involved paired associate learning. Eighty-six concrete nouns were randomly paired and presented to subjects who read the pairs aloud. Subjects then counted backwards and were subsequently shown one word of each pair and asked to recall the other.

Two tasks requiring automatic processing were also utilized. One task involved memory for spatial location and required subjects to look through a book containing photographs of common objects located in 4 quadrants. As they paged through the book they were required to say the names of the objects out loud. They were then shown pictures of items and asked to identify where the picture had originally appeared, but were not told they would have to do this ahead of time.

The other automatic task involved memory for frequency of occurrence. A stack of cards with pictures of familiar objects and their names were viewed by subjects at their own rate as they read the names out loud. Some of the cards were repeated, so the number of times subjects saw each familiar object varied. Afterward, they were shown pictures and asked to estimate card frequency by pointing to a number on an estimating card.

Results did not confirm memory deficits in depressed subjects. There were no significant differences between scores of controls and depressed subjects on either the automatic or effortful tasks. According to the authors, one possible explanation for their findings is that although subjects met DSM III-R criteria for major depression,

the mean depression severity rating of 21.6 on the HRSD was actually in the moderate range as defined by Mowbray (1972). Another possible explanation offered was related to the bimodal distribution of depressed subjects' scores on the IDD and HRSD. Rohling and Scogin suggested that this could indicate that both reactive and endogenous depression types were included in the group of depressed subjects, which may have reduced their chances of obtaining significant results. Their analyses included a comparison of those receiving inpatient treatment with those receiving outpatient treatment as well as a comparison of medicated (taking psychotropic medication) and nonmedicated subjects. They concluded that inpatient status and use of psychotropic medication had greater negative impact on memory than did depression according to this study. Age related effortful encoding deficits were also found, although age related deficits on automatic tasks were minimal.

In contrast to the findings of Rohling and Scogin (1993), most studies in this area suggest that effortful processing is impaired in the depressed while automatic processing remains intact. Based on their review of relevant literature, Hartlage et al. (1993) concluded that the more effort that is needed to complete a task, the more deficits will be present in the performance of depressed individuals. A similar phenomenon called the Age x Complexity effect has been documented in older adults and demonstrates that the more complex a task is, the more difficult it is--thus resulting in more pronounced deficits (Salthouse, 1988). Hartlage et al.'s review also implicated the severity of depression and the valence of the stimulus material as additional factors important to the effects of depression on memory.

Hartlage et al.'s (1993) conclusion that the deficits displayed by depressed individuals on tasks become greater as the degree of effortfulness of the tasks increase was based on their review of studies that examined performance on a variety of tasks. Seventeen studies that examined the intellectual functioning of depressed individuals were reviewed. These studies measured subject performance on intelligence tests such as the WAIS, WISC and Stanford Binet. Studies that utilized

tests such as the Shipley Institute of Living Scale, Wechsler Memory Scale, and the Goodenough-Harris Drawing Test were also included in this analysis. Hartlage et al. examined performance on individual subtests based on the presumed effortfulness of the subtest tasks. WAIS subtests categorized as involving automatic processing included the vocabulary, picture completion and information subtests. Effortful processing was presumed to be utilized during the WAIS block design, and comprehension subtests. Results generally suggested that depression impairs effortful processing, although the authors drew no conclusion as to the effects of depression on automatic processing.

The second type of study examined by Hartlage et al. (1993) involved problem solving tasks, which require primarily effortful processing (Shriffin, 1976). All tasks in these studies met specifications for classification as effortful utilizing Hasher and Zack's (1979) criteria. Examples of tasks included in these studies include anagrams, the Halstead Category Test and an analogies test. Nine studies using depressed clinical samples and nine studies using depressed nonclinical student samples were examined. It was concluded that the degree of problem solving deficits is related to the severity of the depression since studies involving clinical samples, but not nonclinical samples, showed performance deficits related to depression.

Hartlage et al. (1993) also examined 24 studies that examined performance of depressed subjects on learning tasks. Many of the tasks required recognition and/or recall of words or other written material. Although both recognition and free recall are considered to be effortful tasks, free recall appears to require more effortful processing than does simple recognition of information. Studies exploring performance on tasks as diverse as spatial and nonspatial associate learning were also included in the learning task analysis. It was concluded that strong evidence exists that depressed individuals show performance deficits on the learning tasks examined. Evidence suggesting that the degree of effortfulness required by tasks is positively correlated with the severity of deficits was also found in this group of studies.

Yet another group of studies, described as examining effortful encoding processes in depression, was reviewed by Hartlage et al. (1993). Two types of studies were included in this portion of their analyses. Twelve word recall tasks were examined. Seven of these tasks required organizational and clustering skills, which are effortful processes, and five of these tasks required semantic encoding, which is thought to require even more effortful processing. While the results of both types of studies were found to support the notion that depressed individuals show deficits relative to nondepressed cohorts, only the studies requiring recall provided further evidence that severity of depression affects the degree of deficits.

Hartlage et al. (1993) also reviewed four studies that measured performance of depressed individuals on reading tests such as the WRAT reading achievement subtest and the Woodcock Reading Mastery Test. The small number of studies examined suggested that depressive deficits occur on tests of reading comprehension but not on tests that simply required word recognition. This again is consistent with the idea that effortful but not automatic processes are affected by depression. These studies did not suggest that severity of depression is related to degree of performance deficits.

Finally, Hartlage et al. (1993) evaluated a series of studies that examined speed of performance in depressed individuals. They asserted that motor and cognitive speed tasks are effortful and are therefore relevant to their thesis. It was concluded that there is strong evidence that depression impairs motor speed and that the degree of depression is related to the degree psychomotor retardation. Evidence that depression is related to cognitive retardation is mixed according to this study.

The overall results of the studies examined in the Hartlage et al. (1993) review support the notion that depression is associated with deficits in effortful processing of material with neutral affective valence and that severity of depression appears to be related to the severity of performance deficits. In their discussion related to these

findings, the authors hypothesized that alterations in rehearsal strategies may play a part in the poor performance of the depressed on effortful tasks.

Affective Valence

Another conclusion drawn from Hartlage et al.'s 1993 analysis of previous research was that depressed individuals tend to recall significantly more negative than positive material. The relationship between depression and memory for materials with various affective valences was examined in detail by Dalglish & Watts (1990) in their article that examined biases of memory and attention in depressed and anxious individuals.

One portion of the Dalglish and Watts (1990) article reviewed studies that explored memory for materials of various affective valences in depressed versus nondepressed individuals. A phenomenon often called mood congruency was found to be supported by literature findings. The mood congruency effect can be described as enhanced encoding and/or retrieval of positive or negative material while subjects are in a similar mood state. Although some of the studies contained in the analysis used mood induction techniques, many included subjects who were experiencing naturally occurring depression. Evidence from the studies that utilized depressed individuals indicated that depressed subjects demonstrated better recall of negative material and poorer recall of positive material than controls.

An interesting study by Watkins et al. (1992) compared subject performance on memory for material with sad, neutral, and positive affective valences, as well as words that were categorized as physically threatening. Unlike many other studies in the area of mood congruent memory, this project explored memory performance on both effortful and automatic tasks (termed explicit and implicit memory in this study) with respect to the affective valence of the material.

Two groups of 17 subjects (depressed and nondepressed) were selected based on interviews using the Schedule of Affective Disorders, BDI scores and the Shipley institutes of Living Scale scores. All depressed subjects had a primary

diagnosis of depression or dysthymia based on DSM III-R criteria and were seeking treatment for depression. None of the subjects were taking antidepressant medication and all but three had not yet begun psychological treatment for depression. Control subjects were undergraduate college students. Depressed and nondepressed subjects were matched for gender, age and verbal intelligence.

Prior to the experiment, groups of college students rated words as positive, negative, or neutral. Words with 70% agreement rating were selected to form word lists. Physical threat words were obtained from past research such as Mathews et al., (1989). All affective valence categories were utilized, and were divided into three sets of 32, each with eight words from each affective valence category.

Subjects participated in both encoding and memory tasks. During the encoding task, subjects were presented with seven practice words followed by 64 experimental words from two of the three sets of words. They were asked to imagine themselves in a scene involving each presented word. After completing the encoding task, each subject participated in a reaction time task that lasted about 3 minutes. Subjects then performed two memory tasks. For the cued recall task, which measured explicit memory, subjects were given three and four letter stems for words that were presented in the encoding task and told to try and complete them with words from the encoding task. For the word completion task, which measured implicit memory, subjects were given a letter and then asked to complete it with the first word that came to mind.

Results indicated the presence of a mood congruent memory bias for tasks involving effortful memory. However, no mood congruent memory bias was found to be present in the implicit memory task performance. Watkins et al. (1992) concluded that MCM bias in depression is primarily due to activities associated with elaborative processes. The fact that a bias was not found in implicit memory tasks contradicts the hypothesis that mood congruent memory is due to priming or ease of activation. The

authors also suggested that more research is needed to determine the parameters of the mood-congruent memory phenomenon.

Denny and Hunt (1992) did a similar study that explored affective valence and memory in depression. Subjects were depressed and nondepressed women (N=32). The depressed group was recruited from the depression unit of an area inpatient psychiatric facility. To be classified as depressed subjects were required to have a BDI score greater than 15, and meet DSM criteria for unipolar depressive disorder. Nondepressed individuals were recruited from community sources and introduction to psychology classes. Nondepressed subjects in this study had no previous inpatient hospitalizations and no outpatient psychiatric treatment for the past six months. In addition they had scores lower than 10 on the BDI.

Subjects were tested on memory for words with positive and negative affective valence using free recall and word fragment completion tasks. The free recall tasks were labeled explicit (and therefore effortful) tasks while the word fragment completion task was labeled an implicit (and therefore automatic) task. Results indicated that during free recall depressed subjects recalled more negatively valenced words than positively valenced words. The opposite was found to be true for nondepressed individuals who remembered more positively valenced words than negatively valenced words. The differential effect of word valence was absent, however, when the memory test was implicit. For the implicit or automatic word fragment completion task, equivalent priming of positive and negative words was observed. So results of this study are similar to those of Watkins et al. (1992), which showed a mood congruent memory bias for tasks that required active processing but no differences between groups on tasks that were more automatic.

Directions for Research to Advance Understanding

Even with the abundance of literature and review articles available, Burt et al. (1995) asserted that it was necessary to carefully review existing literature and examine the relationship between depression and memory impairment. The purposes

of this extensive meta-analysis were to determine whether depression is associated with memory impairment, explore possible moderator variables, and gather information related to whether or not any supported memory impairment is unique to depression. Ninety-nine studies on recall and 48 studies on recognition in depressed versus nondepressed samples were utilized.

Burt and colleagues (1995) concluded that depression and memory impairment are significantly associated. Further analyses indicated, however, that it is likely that depression is linked to particular aspects of memory, such as effortful processing strategies, which need to be further studied. The association between depression and memory impairment is also found to be moderated by variables such as patient age and status (inpatient versus outpatient). Younger depressed people show more memory deficits in comparison with cohorts than do older depressed people, and inpatients show more deficits than outpatients. Affective valence of stimuli was also found to affect recall. The possibility that impairments are associated with generalized aspects of psychopathology rather than syndrome-specific factors has been noted by various others in the past and was not discounted by Burt's findings.

Burt et al.'s study did a thorough job of organizing existing information, although they emphasized that finding an association between depression and memory impairment falls far short of establishing its cause, causal direction or underlying mechanisms, and that more research is needed to increase understanding of this problem.. Many questions remain unanswered and even unexplored. As mentioned previously, one of the most solid findings in this area appears to be that depressed individuals often show some impairment of effortful but not automatic processing. Yet attempts to measure exactly how depressed subjects differ in their processing strategies from nondepressed individuals have not appeared in the literature.

Possible explanations for established findings regarding memory deficits in depressed individuals often involve the concept of cognitive capacity and were

described in detail by Hartlage and colleagues (1993) . One hypothesis is that depression reduces overall cognitive capacity (Hasher & Zacks 1979) leading to impairment of depressed individuals on effortful tasks. Another hypothesis is that depression does not lead to a reduction in cognitive capacity but instead causes a narrowing of attentional focus, as do other emotional states (Easterbrook, 1959). So depressed individuals allocate cognitive capacity to processing irrelevant and depression-related information rather than task-related information. A third explanation combines components of both explanations and is called the capacity-reduced negative-focus hypothesis. This hypothesis is attributed to Ellis and Ashbrook (1988) and Ellis (1991) and is used to illustrate the relevance of the current project in the Study Development and Description section below.

Burt and colleagues (1995) called for more studies that provide a detailed exploration of variables that lead to impaired performance of depressed individuals on memory tasks. Current studies do not strongly support any of the existing hypotheses and often do not contain information that has the potential to advance understanding in this area because they rarely utilize direct measures of cognitive effort, attention and strategy usage.

Another phenomenon that might be better understood through an analysis of the processing strategies of depressed individuals is their ability to remember negative material better than nondepressed individuals. One general explanation that has been proposed is related to schema theory and has its origins in Beck's (1967) writings on automatic thoughts in depression. This hypothesis states that depressed individuals have a preexisting negative mindset that allows them to process and recall negative information with reduced effort. This explanation has also been used to explain deficits observed in depressed individuals on recall for neutral and positive materials since information that is incongruent with depressed mood and schemata is presumed to require more effort to process and may have fewer available retrieval cues. As with hypotheses delineated regarding effortful processing deficits, additional

information is needed from studies using more informative procedures to determine the validity of this and other related hypotheses that have been proposed to explain mood congruent memory bias.

Study Development and Description

The current study explored the ways in which depression affects information processing in adults. Previous research with depressed and nondepressed individuals has lacked good on-line measures that would allow experimenters to analyze how depressed versus nondepressed individuals process information. On-line measures allow computerized collection of data and record precise measurements related to the process subjects are utilizing while engaged in a task. Online measures provide more direct measures of aspects of information processing such as reading and word exposure times which can help to explain recall results. One online measure, lexical decision task reaction times, has been used successfully to investigate the influence of induced mood states on irrelevant thoughts (Gunther, Ferraro & Kirchner, 1996) and appears to have potential for use with depressed subjects. The present study used two on-line measures to examine information processing strategies employed by depressed and nondepressed subjects while reading prose passages and memorizing word lists of both neutral and negative affective valences. The method that was used for the word recall portion of this study is modeled after a technique introduced by Belmont and Butterfield (1971).

In their 1971 study, Belmont and Butterfield used this technique to compare processing strategies in mentally retarded and normal individuals by examining subject-controlled exposure to randomly generated six-letter lists. Subjects were asked to recall the serial position of a probe letter at the end of each of the 36 trials. Since subjects had control over their exposure to each letter, the inter-letter pauses were timed and used as indicators of processing strategies. It was found that while normal subjects usually increased the latency between pauses as the information load increased, retarded subjects generally decreased their pauses. This processing

strategy difference was related to the memory deficits observed for retarded individuals. Belmont and Butterfield (1971) were able to support the strong connection between processing strategies and memory deficits by demonstrating that some of the deficits present could be reduced with proper use of processing strategies by the mentally retarded subjects.

The present study used an adaptation of the Belmont and Butterfield (1971) procedure and examined word list recall in depressed and nondepressed subjects. During this task, subjects were presented with several word lists of negative and neutral affective valence that were displayed on a computer screen. Immediately after the presentation of each word list, recall of the words was obtained. Each time the space bar was pressed by the subject, a word from the the list was exposed. Each word was displayed for one second and then replaced with a blank screen. The next word was presented when the subject pressed the space bar. The time between successive presses of the space bar was recorded on disk by the computer.

A similar format to that used in Belmont and Butterfield's studies was chosen for the current study because it had not yet been used to compare memory and processing strategies in depressed and nondepressed individuals and clearly had the potential to uncover important information. Ellis (1988) suggested that cognitive capacity available for memory tasks is diminished in the depressed because mood states can affect the allocation of cognitive resources and depressive ruminations may utilize some of the available capacity. The possibility that depressed individuals focus on irrelevant features of tasks was also suggested. Ellis' (1988) theory predicts that memory deficits in the depressed should be related to the encoding demands of the task. In other words, effortful tasks should be impaired in depressed subjects due to the hypothesized reduction in available cognitive capacity. The present study utilized Belmont and Butterfield's methodology to examine the patterns of processing employed by depressed and nondepressed young adults while encoding word lists. Information related to the validity of Ellis' hypotheses about the mechanisms of

cognitive capacity reduction in depressed individuals was obtained using the information from this analysis. The utilization of word lists with both negative and neutral affective valences provides an interesting contrast in light of previous mood congruent memory studies.

In addition to examining memory for word lists, the current study examined variables related to prose passage processing in depressed and nondepressed subjects. A technique similar to that used by Petros et al. (1990) to analyze text processing in good and poor readers was employed for this purpose. Subjects read passages from a computer screen one idea unit at a time. Each time they pressed the space bar, a new idea unit appeared on the screen and previous idea units were covered with dashes. The time between successive space bar presses was used as the reading time or processing time for the idea unit. A comparison of reading times between depressed and nondepressed adults for idea units of different importance levels and passages of neutral and negative affective valence was designed to reveal whether changes in processing strategy are associated with depression.

Studies Examining Prose Passage Recall

Only a few studies have used prose passages to examine memory in depressed subjects. One such study was conducted by Coughlan and Hollows (1984) and compared inpatient and day patient individuals, who were judged to be depressed by their psychiatrists, with nondepressed controls. It compared performance of the depressed and nondepressed groups on story recall, list learning, and word recognition. The only significant correlation between depression and memory impairment found was for list learning performance. Unfortunately, this study included only an analysis of recall performance with no analysis of processing differences.

A series of experiments by Hasher et al. (1985) compared the performance of subjects with depressed mood and nondepressed mood on recall of information from stories with happy, sad, or neutral affective valences. Subjects were administered the Beck Depression Inventory and categorized as depressed or nondepressed using a

number of different cutoff scores. The data were analyzed several times using various definitions of depressed and nondepressed subjects.

One way the subjects were divided was to classify those at or above the sample BDI median as depressed and those below it nondepressed. In all three studies the BDI median was at least six. Another way the subjects were divided was to use the standard experimental definition of depression on the BDI, with scores of nine and above being classified as depressed. A third manner in which subjects were classified was to use extreme groups, with scores of three and below on the BDI classified as nondepressed and nine and above on the BDI classified as depressed. A fourth manner of classification used was to categorized those scoring 14 or above on the Multiple Affective Adjective Checklist (MAACL) as depressed and those scoring below 14 as nondepressed. The fifth way subjects were divided was by extreme MAACL scores (19 and above were depressed nine and below were nondepressed). Finally, subjects were also divided into groups based on standard definitions of depression on both the MAACL (14 and above) and BDI (9). There was yet more variation among the studies as to how these groups were classified, with the second study using some of these classifications and additional ones based on the Symptom Checklist 90 R (SCL 90 R).

The three studies did not find differences between the two groups in either overall written recall or in written recall related to affective content for the five-part passage utilized in this study, which was about a day in the life of a college student and contained descriptions of five events that occurred throughout the day. Three versions of the same passage that had positive, negative and neutral affective valences were utilized. Hasher et al.'s (1985) results differed from those of many previous experiments involving memory tasks, even those that simply used mood induction techniques. They offered the possible explanations that their results may have been due to the simplicity of the recall task, or that the mood variations between subjects were relatively weak.

Ellis (1985) published a commentary that criticized this study for similar reasons. He stated that conditions in which mood will most probably have effects on recall are when the mood is reasonably strong and the task is relatively demanding. Criticism of the mild variations in depressed mood represented in Hasher et al.'s (1985) study and the simplicity of remembering logically structured prose passages were offered to explain their inability to find effects of mood on memory.

In their reply to Ellis (1985) and other critics, Hasher, Zacks, Rose and Doren (1985) discussed their findings and methodology. They defended their use of story recall by asserting that unfortunately there is currently no widely accepted way to determine task difficulty and it is therefore impossible to know if a task will result in recall deficits for depressed subjects. In addition, they described their study as similar to mood induction studies (in that subjects were probably experiencing relatively weak and temporary mood states). They assert that those studies have been shown to yield similar results in their general tendency to yield mood congruency effects only some of the time.

Hasher, Zacks, Rose and Doren (1985) also stated that their research has resulted in dialogue that has raised interesting empirical questions. Some ideas about directions for further research that would help determine the validity of various hypotheses were offered in the context of relevant hypotheses. Two competing hypotheses about how mood congruent memory biases are manifested include Beck's (1967) theory regarding depressive schemata leading to selective encoding of information and a hypothesis suggesting that differences in recall are the result of postencoding processes such as selective rehearsal and retrieval plans (Teasdale & Russell, 1983). They also cited Isen's (1985) hypothesis that the depressive schemata of normal and mildly depressed individuals are less well elaborated and integrated than those of severely depressed individuals and suggest that research to illuminate schematic structure is important for advanced understanding of mood congruency effects.

Prose Passage Utilization in the Current Study

The current study examined memory for prose passages which allowed a detailed analysis of reading times for idea units, and yielded information about memory for idea units of different importance levels. This provided information about how relatively complex information is processed and remembered by depressed versus nondepressed subjects. The criteria for selecting depressed subjects in the present study were more stringent those of Hasher et al. (1985). Depression inventory scores met or exceeded the threshold that indicates significant depressive symptoms on two measures on two separate occasions (specific criteria are outline in Chapter II). This ensured the utilization of subjects with more stable mood states than did that of Hasher et al.'s (1985) study and was implemented to eliminate the problems delineated earlier. The use of both prose passages and word lists to test recall provided information about performance on tasks of varying difficulty which was also important for a more informative investigation.

To further explore the boundaries of mood congruent memory, stories of both neutral and negative valance were included. The utilization of materials of both negative and neutral affective valance allowed analysis of how various elements of processing and memory differ between the two groups as a function of the affective valence of the passage they were experiencing.

Summary of Purpose

In summary, this study attempted to answer questions about the causes and nature of memory differences for prose passages and word lists in depressed and nondepressed individuals. It was designed to provide key information as to whether effortful memory task deficits in depressed individuals are related to an overall cognitive capacity reduction, impaired processing strategies, or a combination of both. The analysis of data related to processing strategies utilized by depressed and nondepressed individuals while performing memory tasks with materials of varied affective valance was designed to meet the crucial need for a more detailed understanding of how and why depression affects memory.

CHAPTER II

METHOD

Subjects

Subjects were 70 undergraduate college students enrolled in psychology courses at the University of North Dakota. All potential participants completed the Beck Depression Inventory (BDI) (Beck, 1967) and the Geriatric Depression Scale (GDS) (Yesavage, 1983) as screening measures prior to participation in this study. Both of these measures are short, easily-administered scales designed to measure self-reported symptoms of depression. Students were selected for membership in depressed and nondepressed groups based on their scores on these instruments. Normative data suggests that scores indicative of depression are 10 or greater for the BDI and 11 or greater for the GDS. Students scoring at or above these scores on both measures were included in the depressed group. Subjects scoring at or below 4 on the BDI and at or below 4 on the GDS were included in the nondepressed control group.

To ensure the preliminary screening was not indicative of a transitory mood state, subjects completed the BDI and GDS again at the time of the study and were discarded if they did not meet the specified cutoff scores. Thirty-two subjects (29.9% of those who met prescreening criteria) were discarded for this reason. Thirty-five depressed and thirty-five nondepressed subjects were included in this study. Subjects were given course credit for their participation.

Screening Measures

The BDI is a well-established and widely used paper and pencil depression inventory that contains 21 groups of four statements. Respondents are required to choose the one statement in each group that best describes how they feel at the

moment. Psychological symptoms of depression are measured by items 1 - 13 and somatic symptoms of depression are measured by items 14 - 21. Higher scores indicate the endorsement of more depressive symptoms such as appetite disturbance and suicidal ideation.

The GDS (long form) is a paper and pencil test that consists of 30 depression-related items in a yes/no response format. It was originally developed for use with older adults. The GDS measures mainly the psychological components of depression such as affect and self-report of life satisfaction, and excludes the somatic symptoms so often included on other depression inventories since many older adults have somatic symptoms that are not related to depression (Yesavage, 1983). Although this scale was developed for use with older adults, there are several studies that advocate the use of the GDS with young adult populations (Ferraro & Chelminski, 1996; Rule, Harvey & Dobbs, 1989; Brannan, Pignatiello, & Camp, 1986). These studies contain solid empirical evidence that this scale is reliable and valid for use with college populations.

Materials

Two narrative stories rated as being neutral in content and two narrative stories rated as having depressive themes were used. A practice story was also used. All passages utilized were of 7th to 8th grade reading difficulty (Dale-Chall readability scores 6.54-6.55). An independent group of 30 college students was asked to divide the passages into idea units. Ratings of whether each passage as a whole was judged to be positive, negative or neutral in affective valence were also collected from the same group. Passages with 70% agreement on the affective valence were included as either neutral or negative passages. The practice story was rated as neutral or positive by at least 70% of students and was chosen to avoid inadvertent mood induction. Additional groups of college students rated the idea units of each story for their importance to the theme of the passage using a three-point scale (Brown & Smiley, 1977). The order of passage presentation was counterbalanced

across subjects to ensure that each passage appeared in each serial position an approximately equal number of times.

Twelve lists of words were also used. Three lists contained words judged to have negative affective valence and three lists contained words judged to have neutral affective valence. Words were obtained from previous studies (Gotlib et. al, 1988; Kuiper, Derry & MacDonald, 1982; Mathews et al., 1989) or chosen by the constructor based on average frequency, syllable length and estimated affective valence. Each word was rated by a group of 50 independent college students prior to constructing the word lists and only words with at least 70% agreement as to their negative or neutral affective valence were used. Four filler lists were presented during this task. All subjects were exposed to two of the filler lists at the beginning of the word list memorization task to allow them to obtain practice and establish a memorization strategy. Filler lists were indistinguishable from the negative and neutral lists. Two mixed lists, containing a combination of negative and neutral words, were also included to reduce predictability that the content of each word list would be either all negative or all neutral. The word lists were matched on their average frequency and number of syllables and appeared on the computer screen for the length of one second before being replaced by a blank screen. Subjects controlled the pace at which they saw the words by pressing the space bar on the computer keyboard. The order of presentation was counterbalanced across subjects to ensure that each list appeared in each serial position an approximately equal number of times. Word lists of different affective valences were presented in an order that was counterbalanced but appeared to be random to subjects (i.e. was not predictable).

The WAIS-R vocabulary subtest, which has shown to be a stable indicator of verbal abilities that is largely unaffected by depression was given to collect information on the verbal abilities of subjects in each group to ensure no differences existed that might explain group differences.

Procedure

At the beginning of each experimental session, subjects were asked to complete the BDI and GDS. They were then given the WAIS-R vocabulary subtest. Depressed subjects were defined as those scoring at or above 10 on the BDI and at or above 11 on the GDS. Nondepressed subjects were defined as those scoring at or below 4 on the BDI and at or below 4 on the GDS.

For both story and word list recall tasks in this study, subjects were seated at an Apple II-e computer terminal. Before participating in the story recall task, subjects were informed that they would be reading five short stories from the computer screen at their own rate, and that they would be asked to orally recall each story immediately after they had read it. They were also informed that the story would be presented one idea unit at a time, moving across the screen in proper paragraph form. Each idea unit was replaced by dashes as the new idea unit was displayed on the screen. Subjects exposed each successive idea unit by pressing the space bar, and the amount of time between presses was recorded by the computer in milliseconds. This provided a measure of reading time for each of the idea units. After reading each story, subjects were asked to recall as much of the story as possible in their own words. Verbal recall was audiotaped and transcribed for scoring purposes.

For the word list recall task, subjects were told that they would be presented with a series of 12 word lists and would be asked to provide recall in any order they chose immediately after reading each list. The subjects were also told that they could control the rate of exposure of each word by pressing the space bar on the computer. A word was displayed for one second and then the screen was clear. The subject was instructed that each time they pressed the space bar, a new word would be presented but would only be exposed for one second. The computer recorded the interval between each bar press in milliseconds.

Design

For the prose passage recall task data analysis there was one between-subjects factor and two within-subjects factors. The between-subjects factor was the group in which subjects were classified as a result of their scores on the BDI and GDS. There were two groups that represented depressed and nondepressed individuals. The two within-subjects variables for the prose passages were affective valence (negative and neutral) and idea unit importance level (high, medium and low).

For the word list recall task data analysis there was one between subjects factor and two within subjects factors. The between subjects factor was group (depressed and nondepressed) and the within subjects factors were affective valence (negative or neutral) and serial position (primacy, middle and recency). The dependent measures in this study were the proportion of idea units recalled, the proportion of words recalled, reading times and pause times.

CHAPTER III

RESULTS

Subject Descriptors

A series of two-tailed t-tests with a significance level of .05 was conducted to determine if there were differences between the groups on the variables age, WAIS-R vocabulary scores, Screening GDS scores, screening BDI scores, GDS scores at the time of participation and BDI scores at the time of participation. Table 1 contains the means, standard deviations and t-scores for both groups on each of these variables. The analyses revealed no significant differences between the groups for age or vocabulary scores. As expected based on selection procedures, the groups varied significantly on BDI and GDS scores during screening and at the time of participation.

Prose Passage Recall

Recall protocols were scored blind for the presence or absence of the gist of each idea unit. The exact wording of the idea unit was not required in order for the idea unit to be scored as correctly recalled. The rater judged whether the main point of the idea unit was retained, regardless of how it was worded. Fifteen percent of the protocols from each group were randomly selected and scored blind by a second rater. The degree of agreement between raters was calculated by dividing the sum of the agreements by the total number of agreements possible. The average interrater reliability was .935, with individual story rating agreement ranging from .815 to 1.0. Recall for each passage was expressed as the proportion of idea units recalled at each of three levels of importance. A 2 (Group) x 2 (Passage Valence) x 3 (Importance Level) mixed ANOVA was conducted on the mean proportion of idea units recalled.

Table 1

Means, Standard Deviations (in parentheses) and t-Values for Age, WAIS-R Vocabulary Scores, and Depression Inventory Scores at Screening and Participation

	Depressed	Nondepressed	T-Value
N	35	35	
Age	21.97 (6.83)	21.63 (4.02)	-0.25
Vocabulary	49.65 (12.90)	52.68 (8.41)	1.15
Screening GDS	16.42 (4.703)	1.06 (1.12)	-18.23*
Screening BDI	17.45 (6.93)	0.82 (0.88)	-13.67*
Participation GDS	16.91 (5.15)	1.00 (1.24)	-17.75*
Participation BDI	19.21 (7.14)	0.57 (0.78)	-15.35*

All significant effects were observed at a significance level of .05. Significant effects were further analyzed using Tukey's procedure with an alpha level set at .05.

The prose recall analysis revealed a significant Group x Passage Valence interaction, $F(1,61) = 5.97$, $p < .02$ (see Table 2). Subsequent analysis using Tukey's procedure indicated that depressed subjects recalled significantly more idea units from negative passages ($M = 60.2\%$) than neutral passages ($M = 51.49\%$). No effect of passage valence was found for nondepressed subjects. A between group comparison revealed that depressed subjects demonstrated significantly greater recall for negative passages ($M = 60.0\%$) than did the nondepressed controls ($M = 55.2\%$). No group differences in recall were observed for neutral material.

Table 2

Mean Proportions of Idea Units Recalled and Standard Deviations (in parentheses)
for Prose Passages by Group and Passage Type

	Neutral	Negative
Depressed	.514 (.119)	.600 (.107)
Nondepressed	.524 (.145)	.552 (.169)

Note. The Tukey critical difference needed for significance was .03395.

A main effect of importance level $F(2,122)=25.93$, $p<.01$ was also present. A subsequent Tukey analysis revealed that recall increased significantly at each level of importance, with average recalls of 50.4%, 54.6%, and 59.2% for idea units of low, medium and high importance, respectively.

A significant affective valence type x importance level interaction was found, $F(2,122) = 10.12$, $p<.01$ (see Table 3). Further analysis of this interaction with the

Table 3
Mean Proportions of Idea Units Recalled and Standard Deviations as a Function of
Affective Valence and Importance Level

	High	Medium	Low
Negative	.594 (.166)	.603 (.165)	.527 (.164)
Neutral	.589 (.160)	.489 (.134)	.480 (.162)

Note. The Tukey critical difference needed for significance was .034.

Tukey procedure revealed that for neutral passages, subjects remembered idea units of high importance more often than idea units of medium and low importance with average recalls of 58.9%, 48.9% and 48.0% respectively. No difference in recall was found for idea units of medium and low importance. For negative passages, subject remembered more idea units of high ($\underline{M} = 59.4\%$) and medium (60.3%) importance than idea units of low importance ($\underline{M} = 52.7\%$), although recall did not differ significantly for idea units of high and medium importance. Recall for idea units of medium ($\underline{M} = 60.3\%$) and low ($\underline{M} = 52.7\%$) importance in the negative passages was significantly greater than recall for idea units of medium ($\underline{M} = 48.9\%$) and low ($\underline{M} = 48.0\%$) importance in the neutral passages.

Prose Passage Reading Times

Mean reading times in seconds for idea units at each level of importance were calculated for both neutral and negative affective valence passages types. A significant main effect of affective valence was found $F(1,43) = 10.70, p < .01$. Subjects had longer reading times for idea units in passages with neutral affective valence ($\underline{M} = 2.721$ sec.) than for idea units in the passages with negative affective valence ($\underline{M} = 2.607$ sec.).

A significant main effect of importance level was also found, $F(2,86) = 22.68, p < .01$. Subsequent analysis using the Tukey procedure revealed that subjects significantly more time processing idea units of high ($\underline{M} = 2.82$ sec.) and low ($\underline{M} = 2.74$ sec.) importance than idea units of medium ($\underline{M} = 2.44$ sec.) importance but spent a similar amount of time processing idea units of high and low importance.

A significant interaction of affective valence type by importance level was found in the reading time analysis, $F(2,86) = 6.08, p < .01$. Table 4 contains the means and standard deviations for reading times at each level of importance and by each type of for passages with neutral affective valence, subjects spent more time reading idea units of high importance ($\underline{M} = 2.98$ sec.) than idea units of low ($\underline{M} = 2.68$ sec.) or medium importance ($\underline{M} = 2.51$ sec.). Subjects spent a similar amount of time reading

Table 4

Means and Standard Deviations (in parentheses) for Reading Times in Seconds by Importance Level

	High	Medium	Low
Negative	2.65 (.934)	2.37 (1.031)	2.80 (1.044)
Neutral	2.98 (1.079)	2.51 (.657)	2.68 (1.340)

Note. The Tukey critical difference needed for significance was .226

idea units of low and medium importance. For passages of negative affective valence, subjects exhibited a different pattern of processing time expenditure. Idea units of high ($M = 2.65$ sec.) and low importance ($M = 2.80$ sec.) were processed significantly longer than idea units of medium importance ($M = 2.37$ sec.). No differences in affective valence. Analysis using the Tukey procedure revealed that processing time were found between idea units at high and low levels of importance, however.

Word List Recall

The proportion of words correctly recalled were computed for each word list as a function of serial position. The first four words of each list were defined as the primacy portion of the list, the middle four words were defined as the middle portion of the list and the last four words were defined as the recency portion of the list. The recall scores were then averaged across the negative word lists and the neutral word lists. These data were then subjected to a 2 (Group) x 2 (List Valence) x 3 (Serial Position) mixed ANOVA. A main effect of serial position was observed $F(2,134) = 51.63, p < .01$. Tukey's procedure revealed that subjects remembered words presented in the primacy position more often ($M = 81.5\%$), than words in the other two positions,

and recall of words from the recency portion of the list ($M = 72.2\%$) was greater than recall for words presented in the middle portion ($M = 55.0\%$),

A significant interaction of Group and Word List Valence, $F(1,67) = 12.74$, $p < .01$, was also found. Table 5 contains the means and standard deviations for word list recall by group and list type. Subsequent analyses of this interaction using the Tukey procedure indicated that nondepressed subjects recalled significantly more neutral words ($M = 78.9\%$) than negative words ($M = 70.1\%$), while no effect of list valence was observed for depressed subjects. Nondepressed subjects were also found to have superior recall ($M = 78.9\%$) to depressed subjects ($M = 65.0\%$) for neutral word lists. No differences in recall were observed between groups for negative word lists.

Table 5

Means and Standard Deviations (in parentheses) for Word List Recall by Group and List Type

	Neutral	Negative
Depressed	.650 (.203)	.684 (.176)
Nondepressed	.789 (.229)	.701 (.206)

Note. The Tukey critical difference needed for significance was .04866.

Word List Pause Times

Median pause times for word lists of both negative and neutral affective valence by serial position were computed for each subject.

Medians were utilized to minimize the susceptibility of the data to extreme scores and ensure that the most representative pause times were examined. A main effect of serial position $F(2,67) = 11.23$, $p < .01$, was found. A subsequent Tukey analysis revealed significant differences in pause times between the primacy (3058) and

middle serial positions (5575 msec.). The recency and primacy serial position medians as well as the recency and middle serial position medians were not found to be significantly different.

A marginally significant main effect of affective valence $F(1,67) = 3.73$ $p < .058$ was also found for median word list pause times with subjects pausing somewhat longer for words on lists with negative affective valence (4582 msec.) than on lists with neutral (4235.11) affective valence.

CHAPTER IV

DISCUSSION

Prose Recall

Results of the present study indicate a mood congruent memory bias in recall for prose passages. Depressed subjects remembered more idea units from passages with negative affective valence than did nondepressed subjects, which is consistent with the majority of previous research that has investigated depression and memory (Dalgleish & Watts 1990). This finding differs however from that of Hasher et al. (1985) whose study is the only known previous investigation to investigate both story memory and mood congruent memory bias. Results failed to demonstrate differential recall of material with various affective valences in college students with mildly depressed mood. The selection criteria for the current study were more stringent and required subjects to demonstrate a consistently depressed mood over time and therefore led to subject groups that demonstrated stable mood states and were therefore closer to clinically depressed populations than subjects in the Hasher et al. (1985) study.

Depressed subjects were not found to have deficits in memory for neutral passages, which is consistent with previous research utilizing prose passages (Hasher et al., 1985; Coughlan & Hollows, 1984) but somewhat incongruent with the general finding of impairment of depressed subjects on effortful processing tasks. One previous explanation offered for nonimpairment of depressed subjects on story memory is the presumably low difficulty level of the task (Ellis, 1985). A second possible explanation is the relatively low level of depression of the subjects in the

present study. This was a criticism of the Hasher et al. (1985) study also, although selection criteria for the current study were designed to ameliorate this problem.

The structure of recall was also examined but findings were inconsistent with group differences in memory for idea units of high, medium and low importance. The absence of any interaction of group with level of importance indicated that depressed subjects did not exhibit any differential pattern of recall that might suggest they were attending to irrelevant details or lacked the cognitive organization to process and then recall a story in a similar manner to nondepressed individuals. Other results related to the structure of recall were within-subjects effects and were generally consistent with previous research demonstrating greater recall for idea units of higher importance levels (Petros et al., 1990)

Reading or processing times for prose passages were also analyzed to determine if group differences existed. Examining reading times for idea units of high medium and low importance for passages of both negative and neutral affective valence had the potential to reveal disparate processing strategies and indicate possible reasons for performance differences in the groups. No differences between groups on processing times for any of the variables were revealed, however. The fact that depressed subjects read negative passages for a similar amount of time and yet demonstrated significantly greater recall is suggestive of an ease of processing and encoding for negative material which is generally consistent with Beck's (1967) schema theory.

Word List Recall

For word list memory, nondepressed subjects were found to have superior recall for word lists with neutral affective valence in comparison to depressed subjects. The recall of the nondepressed group for neutral word lists was superior to not only that of the depressed group's recall but to their own recall for negative passages, which suggests a mood-congruent memory bias. Hasher and Zacks (1985) cited studies that suggest a mood congruent memory bias may also exist in the

nondepressed (Bower, 1981; Bower, Gilligan & Monteiro, 1981; Kuiper, Derry & MacDonald, 1982). The related hypothesis is that moods of various types act as a schema to organize the processing of information and influence retrieval (Teasdale, in press; Kuiper, MacDonald & Derry, 1983). More recently, Bullington (1990) completed a study and reviewed existing literature related to mood-congruent memory in individuals with both positive and negative moods. Although most of the existing studies of this type have utilized mood-induction techniques to produce elated or depressed moods, the majority of evidence supports the presence of a mood-congruent memory bias in subjects with both mood states.

The absence of a mood congruent recall bias in depressed subjects is inconsistent with previous work (Burt, Zembar & Niederhe, 1995; Dalgleish & Watts, 1990). The reason for the change in pattern of results (nondepressed subjects exhibiting this bias rather than depressed subjects) during the different tasks is not immediately clear, although it may have to do with the task demands.

Memorization of word lists is a task that presumably requires more effortful and perhaps strategic processing than does providing free recall of logically structured passages. Impairment of effortful processing in depressed subjects and enhanced recall of neutral material relative to negative material in nondepressed individuals may have combined with the mood congruent memory bias in depressed individuals to produce this result. The mood congruent memory bias demonstrated by depressed subjects on the prose memory task may have mitigated effortful processing deficits in the depressed and allowed similar recall of negative word lists in the two groups.

Structure of recall for word lists based on the serial position of words during initial presentation was examined. No differences were found between groups in structure of recall for primacy, middle and recency word list portions. A previously well-documented tendency to remember more words in the primacy and recency serial positions was found (Beimont & Butterfield, 1971, Murdock, 1968) for all groups.

No differences were found between depressed and nondepressed groups in their self-paced exposure times to words in the primacy middle or recency portions of word lists. This suggests that basic processing strategies remain similar in mildly depressed and nondepressed individuals despite differences observed in recall patterns. Results of the word recall data, like the prose data, support the idea that a mood-congruent schema resulted in ease of processing and encoding of neutral material in nondepressed subjects since differences in recall were found in the absence of processing strategy and recall structure differences.

Limitations of the Current Study

One limitation of the current study is that depressed subjects were not drawn from clinical populations and therefore may not have exhibited the same the level of impairment that clinically depressed subjects would have demonstrated. Participants with a clinical diagnosis of depression may have displayed a pattern of performance that more clearly supported the presence of deficits on effortful tasks, especially for the word list portion of this study.

A related issue is that the conclusions that can be drawn from this analysis are limited since memory deficits were not found in depressed subjects. It is possible that had the depressed subjects been more depressed or the task more difficult, differential patterns of recall or processing strategies would have been revealed. The main difference exhibited between groups was for recall of material that was mood congruent. The fact that processing strategies and structure of memory did not differ between groups in any way, yet this effect was produced suggests that the mood congruent memory bias may not be the result of additional effortful processing.

Two related questions that were not resolved at the completion of this project but could possibly be answered with further correlational analyses are why the mood congruency effect was not observed for nondepressed subjects on the prose passages as it was with the word lists and why the pattern of results changed between tasks.

Directions for Future Research

Further study of the structure of memory and the processing strategies that depressed and nondepressed individuals employ is clearly needed. Subjects experiencing more severe depression would be most useful in increasing our understanding of the effects of depression and memory. While the mood congruent memory bias appears to be very robust even in individuals with lower-grade depression, effortful task processing deficits were not as readily observable in this study.

Related to this set of findings is an interesting consideration. If the current study's word list memorization task had contained only materials of neutral affective valence, results would have been interpreted as a deficit in memory for the depressed subjects. The pattern of results in context of results of the word lists of negative affective valence precludes this, however. A question of methodological importance related to studies on depression and memory is whether or not an informative study can be done that does not contain materials of more than one affective valence.

Results of the current study suggest that at the very least affective valence of materials utilized warrants consideration. Studies that have measured recall and failed to consider affective valence presumably utilized neutral materials. However, without a clear determination of the affective valence for the materials that were utilized and a second or third level of affective valence, it is difficult to determine whether results actually demonstrated deficits in depressed subjects or mood-congruent memory bias in nondepressed subjects.

Because subjects in this study were only mildly to moderately depressed, it is difficult to determine if the pattern of performance demonstrated would be similar with clinical populations. A study designed to explore this question might include two depressed groups and a nondepressed control group and compare their performance on various tasks with at least two types of affective valence.

The mood congruent memory bias observed in depressed individuals in light of the nature of this recall task may have implications in support of the schema theory of cognitive processing in depression that suggests subjects easily activate and selectively encode depressive information congruent with their mood (Beck, 1967, Kuiper, MacDonald & Derry, 1983). Competing hypotheses suggest that depressed subjects remember more negative information because of elaborative processes (Williams, 1988), postencoding factors or selective retrieval plans (Teasdale & Russell, 1983). The current task required subjects to give immediate recall of stories and therefore allowed less of an interval for post-encoding and elaborative processes to take place. A similar study examining mood congruency effects that includes groups who engage in different recall tasks may be informative. Comparison of the recall of depressed subjects who provide recall immediately and at later intervals would provide information about the strength of mood congruency effects before and after subjects have had time to encode and retrieve information. If postencoding processes are important in this phenomenon then mood congruency memory bias should be even stronger when recall is delayed.

Another related hypothesis about depression and memory (Ellis & Ashbrook, 1988) suggests that cognitive capacity in the depressed subjects is reduced and possibly narrowed with unusual focus on negative detail. It is also suggested that part of the reason their capacity is reduced is that their depressive cognitions are preoccupying. When interpreted as a whole, there is no suggestion that either a reduction in cognitive capacity or a narrowing of focus was present in the current subjects. The unusually detailed analysis, which provided analyses of both structure of recall and processing strategies was designed to detect such differences but suggested none despite differential recall due to mood congruent biases for both tasks.

Results then are consistent with an overall greater efficiency of encoding and recall for material of affective valence in the depressed on simple tasks and no documented deficits on tasks that require greater effortful processing (unless of course

results of the neutral word list recall had been interpreted out of the context of the negative word list recall). This efficiency can be inferred since no differences in processing times or recall structure that would suggest compromising of normal effortful processing strategies was found and the overall proportion of idea units remembered was greater on the passage recall task.

The fact that no differences in processing strategies or recall structure were found between groups despite finding differences between groups on memory due to affective valence on both tasks is intriguing and poses a challenge to future researchers to isolate variables that contribute to differences in memory associated with depression.

APPENDIX A
PROSE PASSAGES

SALLY
(Negative Affective Valence)

Sally held back the tears
as she trudged through the snow
on her unshoveled sidewalk
in the zero degree chill
that had blanketed the city for nearly a week.
She had been 25 minutes late for her shift that evening
at the all-night diner
where she had been working for only a week.
Jim, her normally friendly boss,
had glared at her
as she fastened her apron
and grabbed a pad of tickets from the stack beneath the cash register.
Later that evening
he took her to his office
where he gave her a warning.
If she were late again
he would cut back her hours.
Now as Sally entered the front door of her home
she realized that there was little food in the house
and her two sons, ages 6 and 7,
would be home soon.
She surveyed the cupboards and refrigerator
hoping to find something to make them for supper.
Sally stared at the lone box of macaroni and cheese
and imagined the complaints her children would voice
about having to eat the same supper two nights in a row.
But she had no choice,
so she put some water on the stove to boil
and slumped down onto the hard orange kitchen chair
and sobbed.

MICHAEL
(Negative Affective Valence)

Michael stumbled over the pile of books beside his bed
as he searched for a pencil
to take to his American Literature exam.
He had fallen asleep
while studying the night before, exhausted
from his daily shift at Bob's Amoco.
A wave of fatigue and dread engulfed him
as he thought about taking the exam
for which he was not prepared.
His grades had been poor last semester
and even his best efforts did not seem to please his professors.
By now he had resigned himself to performing below the expectations of his parents.
Michael wished that he could find the courage
to tell them that he wanted to take a break.
It was only midterm
and the semester seemed to be dragging on forever.
All of childhood his friends were at other colleges
and he felt isolated here.
Classes and a 30 hour work week at the gas station
left him little time to socialize.
He stuffed his books in his backpack,
forced his shoes on without untying them
and glanced at his grey-clad slouching figure in the mirror.
As he was about to exit his dorm room,
the phone rang.
Michael was running late
but answered it anyway,
hoping that it would be Jill since
she hadn't returned his calls in over a week.

JILL
(Neutral Affective Valence)

Jill glanced around the blue and white cubicle.
This is it, she thought,
my first real job.
Just last week she had received the call from Bob Sanchez
who informed her that she had been chosen to be the assistant to the personnel
director
for the largest department store in the city.
She had been hoping for a job with an advertising agency
but had not been able to find openings.
This isn't exactly where she had imagined herself
when she graduated from Arizona State University
with a master's degree in communications four months ago.
But jobs were hard to come by
and this was a start.
She was ten minutes early
and quickly began unpacking items from home
to make the cubicle more attractive.
She placed a picture of her black lab, Bosco,
on the left hand corner of the desk.
Her favorite mug with the Navajo artwork
went on the right.
The office was beginning to fill up with employees now.
She smiled at her new co-workers shyly
and was pleased that some of them took the time to introduce themselves.
"I'm sure you'll like it here." declared Susan,
a middle-aged woman with a broad smile and bright red glasses.
Jill smiled back through her uncertainty
and responded with agreement.

O'BRIEN
(Neutral Affective Valence)

All the children in the city
were amazed by the O'Brien home,
which was one of the few examples
of solid-style wooden structures
that hadn't been demolished in Boston's urban renewal campaign
at the turn of the century.

The O'Brien family had been able to avoid this
Because of its wealth and political influence
and the house was passed on through several generations
to the present.

Old Man O'Brien had no family,
so when he died

the home went up for auction,
and the Urban Center bought it.

When local officials arrived for an appraisal,
they discovered that the house had a backyard,
which was forbidden
due to zoning restrictions.

In the yard was a live tree--

An oak was what Mom called it.

When the news of the tree's discovery leaked out,
quite a few sightseers stopped by
to have a look at it.

Now it has become a favorite spot
for school field trips and family excursions.

Mom and Dad get nostalgic
every time we visit.

It is hard for me and my sister Serena
to imagine a world with large trees
and spaces in the backs of houses
where children can play.

Still, our parents insist
that it was like that in the old days

APPENDIX B
WORD LISTS

NEGATIVE WORD LISTS

INTIMIDATION
 ATTACK
 DESPISE
 GRIEF
 POVERTY
 HOSTILE
 EMPTY
 HELPLESS
 MISTAKE
 FAIL
 WEARY
 FUNERAL

DOWNCAST
 STRESS
 HUMILIATION
 COLLAPSE
 DULL
 LONELY
 USELESS
 DISEASE
 TIRED
 TUMOR
 STUPID
 DESTROY

GUILTY
 INADEQUATE
 WEAK
 SUFFER
 REGRET
 BATTERED
 PAIN
 DEFEATED
 STRUGGLE
 COFFIN
 FRAUD
 CRY

NEUTRAL WORD LISTS

SHAMPOO
 NARROW
 ASPECT
 PROBABLE
 BOILED
 SEATED
 MOTIVE
 THICK
 RECTANGULAR
 SPEAK
 CARPET
 INK

PEAR
 ATTEMPT
 COMPILED
 STACK
 FREQUENT
 ACQUIRED
 DRIED
 SYSTEM
 BASIN
 ROUTINE
 BUFFER
 LOCATED

CIRCULAR
 OBVIOUS
 SCARF
 PROTEIN
 CHANGING
 PREDICT
 SHAPE
 OVEN
 COMPACT
 POCKET
 MEDIUM
 GLANCE

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