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Johnson, Mark Harvard

THE RELATIONSHIP OF MOOD-STATE AND SEVERITY OF PSYCHOPATHOLOGY TO MEMORY PROCESSES IN PARANOID SCHIZOPHRENIC, NONPARANOID SCHIZOPHRENIC, BIPOLAR MANIC AND UNIPOLAR DEPRESSED INPATIENTS

The Ohio State University

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THE RELATIONSHIP OF MOOD-STATE AND SEVERITY OF PSYCHOPATHOLOGY TO MEMORY PROCESSES IN PARANOID SCHIZOPHRENIC, NONPARANOID SCHIZOPHRENIC, BIPOLAR MANIC AND UNIPOLAR DEPRESSED INPATIENTS

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in the Graduate School of the Ohio State University

BY

Mark Harvard Johnson, B.A., M.A.

The Ohio State University

1985

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DEDICATION

To my parents, who encouraged me to pursue my ambitions, no matter how torturous the path, and to my wife, for helping me navigate the course.
I would like to thank the following for their aid during various phases of this project. My advisor, Dr. Peter Magaro, for his critical and insightful comments and suggestions from the inception to completion of this project: his theoretical and practical knowledge of this area were a never ending source of information and intellectual stimulation. The members of my committee, Dr.s Charles Wenar and Steven Beck, for their careful reading of and comments on an earlier draft of the proposed model, as well as their suggestions regarding methodological considerations of this study. The psychiatrists and psychiatric nursing staff of OSU Hospitals, the former for their willingness to allow me to interview and examine their patients, the latter for their invaluable aid in the execution of the project; without whose cooperation, helpfulness and goodwill this project could not have been completed. Finally, and perhaps most importantly, I would like to thank the patients who participated in this study, who in the midst of the confusion, terror and despair of a major psychiatric disorder, allowed me to briefly glimpse a fraction of their experience, in the hope that the information shared might in some way help those who will follow the same difficult road.
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INTRODUCTION

The affective disorders consist of a collection of mental illnesses whose primary disturbance is one of affect. Depression, the most prominent of this group, has as its primary symptom a pervasive dysphoric and melancholic mood. Although ranging in severity, sadness remains the central aspect of the depressive disorders. Mania, on the other hand, is characterized by distinct periods of elevated, expansive or irritable mood.

A plethora of research has been devoted to identifying the various causal and concomitant factors which are associated with depression and mania, including issues of diagnosis (Andreasen, 1982, 1983; Nelson & Charney, 1980; Thompson & Hendrie, 1972), etiology (Paykel, 1982; Boyd & Weissman, 1982; Gagratand & Spiro, 1980), personality (Perris, 1966, 1971; Von Zerssen, 1982; Johnson, 1983), genetics (Taylor & Abrams, 1980; Mendelwicz, 1980), neuropharmacology (Zis & Goodwin, 1982), and treatment (Arieti, 1982; Klerman & Schecter, 1982). The last two decades have also witnessed a burgeoning interest in the cognitive processes in these disorders, especially memory deficits in depression (Miller, 1975; McAllister, 1981; Weingartner, Cohen, Murphy, Martello, & Gerdt, 1981). It is this area concerned with cognitive processes in the
affective disorders to which this effort addresses itself.

The primary aim of the present investigation was to examine two hypotheses which were generated as a result of a consideration of the literature examining cognitive processes in the affective disorders. These hypotheses will be more fully explicated in a later section of this document following a review of this literature. Stated briefly, two variables, mood-state and severity of psychopathology, appear to play important roles in the cognitive functioning of patients with affective disorders. Mood-state is suggested to be a determinant of content in memory, while severity of psychopathology is thought to disrupt the organizational properties of the information processing system, leading to the memorial deficits associated with the affective disorders, particularly depression. That is, rather than cognitive deficits being specific to depression or mania, these deficits may be more appropriately regarded as functions of mood and severity of psychopathology. As mood-state and severity of psychopathology are not conditions unique to depression and mania, we might expect these processes to assume similar roles in other psychiatric disorders as well. For this reason two psychiatric groups in addition to normal controls were included in the present study in order to examine if the formulated relationship between mood-state, severity of illness, and memory generalized to other nonaffectively disordered psychiatric patients.

The format of this document will be as follows. First, a consideration of methodological difficulties present in the
literature of interest will be presented. Second, the structural aspects of the memorial processes of depressed patients will be reviewed and discussed, with some attention devoted to "noncognitive" processes which may interfere with adequate trace storage. Third, the literature examining memory content in depression will be presented. Following this discussion, memory processes in mania will be reviewed and critiqued. As schizophrenic patients are included in this investigation and as considerable effort has been expended toward identifying structural memory deficits associated with these disorders, a brief synopsis of the most salient aspects of this literature will be included. Having reviewed the relevant literature, a model will be presented integrating the diverse elements of the literature examining the memory processes of affectively disordered patients. Following the presentation of the model, hypotheses tested in the present investigation will be delineated. The presentation of the model and resultant hypotheses will conclude the introductory portions of this manuscript. Having concluded this section, the method utilized and subsequent results obtained will be presented. The document concludes with a discussion of the results and implications of this investigation regarding the role of severity and mood-state in the cognitive processes of the affective disorders.
Methodological Review

A number of the studies reviewed in the following discussion were found to be marred by one or more of the following methodological flaws involving subject selection: 1) use of electro-convulsive therapy (ECT) within three months of testing; 2) inadequate diagnostic procedures; 3) inadequate/inappropriate control groups; 4) inappropriate sample composition; 5) use of analogue subjects; and 6) inadequate medication control. Each problem will be discussed in terms of the studies in which they were encountered.

ECT. The debilitating effects of ECT on memory in terms of anterograde and/or retrograde amnesia lasting between one and three months have been established and accepted for some time (Cronholm & Molander, 1964; Squire, 1977; Halliday, Davison, Browne, & Keeger, 1968). Given the memory deficits produced by ECT, inclusion of patients receiving ECT in studies investigating memory processes in depression should be considered ill-advised. However, due to its efficacy in treating depressions resistant to psycho- and pharmacotherapy, ECT is often considered the treatment of choice in such instances (Kiloh, 1982); thus depressed patients treated with ECT are often included in samples examining memory processes.

Several investigators have reported memory studies in which depressives have received ECT within three to four months of testing, or have failed to report time elapsed since last treatment. Whitehead (1973) reported cognitive deficits in demented and depressed patients, with a group of depressed patients
receiving ECT as recently as two weeks prior to testing. Similarly, Kusumo and Vaughan (1977) examined short and long-term memory in a group of "well" patients with major affective disorders who had received ECT as recently as six weeks prior to testing. Other investigators have reported the inclusion of subjects who were not currently receiving ECT but may have received ECT in the past, with no mention of when the last treatment was received (Clark & Teasdale, 1982; Neville & Folstein, 1979).

Although these results indicating a memory deficit have been attributed to the depressive condition, the most that can actually be said about cognitive deficits in such studies is that memory is affected by ECT in depressed patients. Nothing can be actually be said regarding the memory of depressed patients per se. Therefore, a conservative approach to this problem is warranted, limiting experimental groups to patients who have not received ECT within the last six to twelve months, as some investigators have already done (Lloyd & Lishman, 1975; Lishman, 1972; Reus et al., 1979; Breslow et al., 1980).

Diagnosis. Diagnostic classification systems have gone through a number of changes during the last century, the most promising recent development for researchers being the Research Diagnostic Criteria (RDC-Spitzer, Endicott, & Robbins, 1978). Although this system is of rather recent origin other reliable systems predated the RDC, such as the Feigner et al. criteria (Feigner et al., 1972) and the Present State Examination (Wing et al., 1974). Although these systems have been available for some
time, various researchers have preferred non-standard and idiosyncratic criteria to these standardized classification systems.

A variety of authors have included patients in their diagnostic groups based solely upon hospital diagnosis (Davis, 1979; Harness, Bental, & Carmon, 1977; Miller & Lewis, 1977; Larner, 1977; Russell & Beekhuis, 1976; Whitehead, 1973; Wyrick & Wyrick, 1977). As hospital diagnoses have been known to change over time with some frequency, individuals originally diagnosed as schizophrenic, for example, may in fact later exhibit a psychotic depression or mania. Further complicating the use of hospital diagnoses are "overlapping" states such as the schizoaffective disorders. Finally, agreement between diagnosticians has been found to be rather low without the aid of standardized diagnostic criteria (Matarazzo, 1983), suggesting that hospital diagnoses may only reflect the opinion of a single diagnostician, rather than being an accurate appraisal of a psychopathological state. Given these difficulties, reliance upon hospital diagnosis only may not ensure a homogenous sample with regard to psychopathology. Rather, use of reliable standard diagnostic instruments such as the RDC would be more appropriate in order to reduce diagnostic heterogeneity within patient samples.

Diagnostic Homogeneity. A related issue that is the separation of manic and depressed patients into separate groups. The diagnostic subcategories of the affective disorders include unipolar depressed, unipolar manic, and bipolar disorders which
might be predominantly characterized by mania, depression, or a mixture of both. Bipolar and unipolar affective disorders appear quite different in regard to symptomatology, response to medication, age of onset, and course of illness (Klerman, 1973; Perris, 1982), raising the possibility that these disorders may be characterized by unique cognitive processes as well. Therefore, these disorders should be separated into individual groups and contrasted in an experimental design. However, some studies have combined unipolar and bipolar forms of the affective disorders into one group. Kusumo and Vaughan (1977) included bipolar and unipolar patients in their investigation of the effects of lithium salts on memory in patients with affective disorders maintained on lithium. Similarly, Telford and Worrall (1978) considered patients suitable for inclusion in their study of manic-depressive illness whether or not they had experienced a depressive episode, while Savard, Rey and Post (1980) also combined unipolar and bipolar affectives who were currently experiencing a depressive episode.

Given the very different biologic, etiologic and symptomatic aspects of depression and mania, the combination of such subjects into one group is questionable. The differential response of manics to lithium as compared with most unipolar depressives (Coppen, Metcalfe, & Wood, 1982), alone may be enough to warrant skepticism with regard to combining these two groups. Further, until recently, actual cases of unipolar mania were considered to be quite rare (Perris, 1982). However, recent evidence suggests that unipolar mania is much more common than had previously been
thought (Nurenberger et al., 1979; Abrams et al., 1979): thus there exists the possibility that significant differences may indeed exist between manics who have or have not experienced a depressive episode. Therefore, studies intending to examine the relationship between the affective disorders and some dependent variable would do well to provide homogenous subtypes of unipolar and bipolar affective disorder groups.

**Diagnostic Specificity and Level of Pathology.** Although most research efforts employ various types of control groups, the type of control group employed is often inadequate for the hypotheses being examined. Primarily, the major fault in the depression literature is the absence of psychiatric controls. Many studies investigating cognitive functioning in the affective disorders employ normal volunteers and fail to include the more appropriate psychopathology control group. Normal controls provide an indication of whether or not the variable in question is of potential interest—that is, does the experimental group differ from normal subjects along some dimension (Neale & Oltmanns, 1980). However, beyond providing an anchor point by which to judge deficits, the demonstration of differences between pathological and normal groups of subjects can in many cases be considered trivial because the presence or absence of a deficit in relation to normal controls provides no information with regard to diagnostic specificity (Chapman & Chapman, 1977).

Without such psychiatric controls, it is not known if performance is merely a function of having a psychiatric disorder
rather than being characteristic of a specific diagnostic group (Neale & Oltmanns, 1980). For example, Savard, Rey and Post (1980) compared patients with major affective disorders to their spouses and normal volunteers. Breslow, Kocsis and Belkin (1981) compared the long term memory of 21 hospitalized depressives to 21 control subjects free of psychiatric history. Examinations of short and long-term memory function in depressed patients have also only employed normal control subjects (Sternberg & Jarvik, 1976; Weingartner et al., 1981; Cohen et al., 1982). The question remaining in each of these studies which report a particular type of memory deficit characteristic of depressed patients is whether the deficit is a characteristic of the specific diagnostic group or is a function of undergoing the general disorganizing effect of a psychiatric disorder.

A second reason for employing a group of individuals who have received a psychiatric diagnosis is that the inclusion of such a group provides a control for competing explanations with regard to differences noted on the dependent measure due to presence or severity of global pathology (Chapman & Chapman, 1973). Issues of control with regard to severity of pathology and disorganization have often been addressed by researchers investigating cognitive processes in schizophrenia (Chapman & Chapman, 1973; 1977; Neale & Oltmanns, 1980; Magaro, 1980; 1984), and are equally important for research in the affective disorders. For instance, chronic and more severely disturbed patients rarely perform as adequately as do short-term or less severely disturbed patients on most dependent
variables (Chapman & Chapman, 1973). Researchers examining cognitive processes in schizophrenia and controlling for secondary effects of the disorder have for the most part found effects noted on the dependent measures to be related to secondary pathology processes rather than the core schizophrenic process (Otteson & Holzman, 1976; Ritzler, 1977). Unfortunately, the lack of control of pathology in any form has usually characterized research efforts examining cognitive processes in the affective disorders. The failure to include such controls has made the identification of deficits or processes unique to these disorders virtually impossible.

In brief, at least two classes of control groups are necessary to adequately test the hypothesis that a given memory deficit is unique to mania or depression. First, normal controls should be included in order to provide a baseline measure against which to compare the group of interest. Second, psychiatric controls must be included to demonstrate the specificity of the deficit, and that it is not attributable to the presence, severity, or length of illness. Investigations which fail to provide these minimal levels of control produce results which are difficult or impossible to reliably attribute to the variable of interest—e.g., membership in a specific diagnostic group.

Analogue Research. Given the relatively easy access to introductory psychology students for use as experimental subjects, many researchers have utilized undergraduates in investigations of cognitive processes in the affective disorders. Much of this
analogue research has focused upon testing the hypotheses of Seligman and his colleagues with regard to the learned helplessness and reformulated learned helplessness hypothesis (Seligman, 1975; Abramson, Seligman, & Teasdale, 1978). Additionally, many investigations examining Beck's (1967; Kovacs & Beck, 1978) cognitive theory of depression have also used psychology undergraduates and the Beck Depression Inventory (BDI-Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) to identify "depressed" versus "nondepressed" subjects (Davis, 1979; Zuroff, 1980; Kuiper & Derry, 1982; in press; Nelson & Craighead, 1977; Klein, Fencil-Morse, & Seligman, 1976; Garber & Hollon, 1980; Harvey, 1981; Ingram et al., 1983).

Various criticisms have been leveled at the use of college students as analogue subjects in depression research. Depue and Monroe (1978a) have argued that there is a qualitative as well as quantitative difference between clinically depressed patients and depressed college students. Further, Doerfler (1981) has pointed out in his methodological review of treatment outcome studies that college students are a restricted sample with regard to age, SES and education level.

Most authors utilizing the analogue approach cite the results of a study reported by Bumberry, Oliver and McGlure (1978) as validating the use of undergraduate analogues in depression research. This study shall be reviewed in some detail to demonstrate that the faith placed in this study is not well founded. The study was designed to discover if the BDI is as
sensitive as a psychiatrist's rating for the presence or absence of depression. Cut-off scores recommended by Beck and colleagues (Beck et al., 1961) were used to classify 56 undergraduates as either free from depression or mildly, moderately or severely depressed. A psychiatrist interviewed and rated each subject using the same categories as those provided by the BDI scores. The authors reported a correlation coefficient between psychiatrist rating and BDI score of .77. A second experiment was then conducted with 27 additional subjects, varying the time between psychiatric interview and BDI by 1 to 14 days. In this condition the correlation coefficient dropped to .30. Based upon the correlation obtained in the first experiment, the authors concluded (as have others following them) that the BDI is a valid instrument for identifying depressed college students. However, there are a number of statistical and procedural issues that should be considered.

First, in experiment one, approximately 50% of the cases were misclassified by the BDI. Using the psychiatrist's rating as the criterion, only 29 of the 56 cases were correctly classified by the BDI. This result suggests that the BDI is not sensitive to those aspects of depression judged by psychiatrists to be critical for a diagnosis of depression.

This result, however, is supportive of Beck et al. (1964) who specifically stated that the BDI was not intended for use as an instrument to identify depressed versus nondepressed individuals. Rather, this instrument was standardized on patients previously
diagnosed as suffering from a major depression and hence was recommended for use with such patients to ascertain the depth of the depression. In fact, although this study revealed a poor hit record, there was a strong correlation between the scale and the psychiatrist's rating of degree of depression. Therefore, the BDI should be seen as a measure of severity of depressed mood in non-depressed populations, rather than isolating the presence of a depressive disorder. This crucial distinction will be returned to later.

The next difficulty with the Bumbery et al. (1978) study was that the "inter-rater" reliability between the BDI and psychiatrist's rating was obtained by computing Pearson product-moment correlation coefficients. As pointed out by Matarazzo (1983), this statistic does not control for chance agreement between raters. The kappa statistic (Spitzer, Cohen, Fleiss, & Endicott, 1967) would be more appropriate since it does correct for chance agreement between raters. Use of the kappa coefficient invariably results in a value lower than that obtained by using a product-moment correlation coefficient (Matarazzo, 1983). Thus, the high correlation obtained in this study may be attenuated if kappa is used, with the resulting relationships between BDI and psychiatrist's rating corresponding more closely to the hit-miss record observed.

However, even if one is willing to accept the correlation coefficient, an explanation is necessary for the large drop in the correlation when time between the BDI and interview rating was
varied (experiment 2). The decrease may suggest that the BDI is tapping a transient mood-state in college populations. That the scale is measuring a transient mood-state is a serious consideration because depression is not a condition of transient moods, but of a relatively stable period of dysphoria. Both the DSM-III and the RDC require symptom durations of at least two weeks and one week, respectively. Given the low correlation value reported in the second experiment, one may assume that in many of the cases reported the symptoms were far from stable. In effect, in this population, the BDI may be measuring mood-state rather than accurately indicating the presence or absence of a depressive episode. Depressed mood does not characterize only major depressive disorders. For instance, significant levels of depression in samples of hospitalized schizophrenics have also been noted (Mellor, Sims, & Cape, 1981; Johnson, 1981; M. Johnson, 1983).

In light of the above considerations, it appears that the reliance upon this study as evidence of the validity of using college students as analogue subjects in depression research is premature. Beside the use of the kappa statistic rather than the product-moment correlation coefficient, the score obtained on the BDI by college students should reflect the same condition as that exhibited by any depressed population. The evidence to date suggests that depression as measured by the BDI in college students is not stable; rather it appears to be a transient mood-state, and as such may not produce valid samples for investigating cognitive
processes in clinical depression. Until such evidence is forthcoming, investigators interested in the affective disorders would do well to focus on clinical populations rather than follow the route of least resistance to the college student in the analogue situation.

Thymoleptic Medication. Researchers have long been concerned with the possible confounding effects of psychotropic medications, especially researchers working with patients receiving phenothiazines (Magaro, 1980; Otteson & Holzman, 1976; Killian, Holzman, Davis and Gibbons, 1984). Investigators examining the affective disorders, especially mania, have focused upon the effects of the tricyclics and lithium.

- Lithium has been found to decrease memory performance in a number of studies. Kusumo and Vaughan (1977) tested short- and long-term memory in patients maintained on lithium for three months to four years. The patients maintained on lithium were found to exhibit short-term memory impairment. Reus, Targum, Weingartner and Post (1979) compared subjects maintained on prophylactic doses of lithium to bipolar patients who had discontinued lithium for at least three weeks on a multi-trial free recall task. The lithium group recalled significantly fewer words across trials than the non-lithium group, leading these authors to conclude that lithium produces a relative inability to transfer information from short-term memory to long-term memory, or to retrieve newly encoded material from long-term memory. Zerbi, Clemente, Bezzi and Tosca (1981) examined the effects of lithium prophylaxis on unipolar
depressives who had received lithium from six months to seven years. Subjects who had been on lithium for the longest period of time had more impaired recall of past events. Finally, Weingartner and colleagues (Henry, Weingartner, & Murphy, 1973; Reus, Silberman, Post, & Weingartner, 1979) have demonstrated that psychoactive compounds such as catecholamine precursors and amphetamine affect recall in depressed patients.

The implication of these reports is that both lithium and catecholamine precursors produce cognitive deficits apart from the psychiatric state. Such results mandate caution in interpreting cognitive deficits in the affective disorders when testing samples receiving such medication.

The above discussion has presented some of the main difficulties with regard to possible confounding subject variables which currently exist within the literature examining cognitive processes in the affective disorders. Failure to adequately control these dimensions has resulted in a host of research efforts seriously compromised with regard to providing an adequate test of the hypothesis under study, namely, the particular cognitive processes unique to depression.

Memory Structures in Depression

This section reviews studies that have attempted to identify the memory processes characteristic of the affective disorders. In addition to examining structural memory processes, the effect of non-structural properties on memory such as effort and response
bias will also be examined.

**Memory.** Given the frequent complaints of memory impairment reported by depressed patients, a number of investigators have attempted to experimentally verify this phenomena. In an early effort examining cognitive processes in depression Friedman (1964) compared severely depressed inpatients and normal controls matched for age, sex, education, religion, and marital status on 33 cognitive, perceptual and motor tasks. In addition, subjects completed the Clyde Mood Scale, a self-report measure of hedonic mood. Results indicated that depressed subjects were impaired on only nine of the 82 test scores reported. Friedman concluded from these results that those processes most likely to be impaired in severe depression were short-term memory, psychomotor speed, mental set, flexibility, and orienting behaviors. However, given the number of comparisons made, one must consider the possibility that the significant results obtained were due to chance (Myers, 1979). Depressed subjects, however, were found to significantly differ from controls on 63 of the 77 items of the Clyde Mood Scale. Whereas depressed patients differed from normals on only 11% of the performance tasks, they self-rated as being different from normals on 82% of the mood scale items. Friedman concluded that the actual abilities and performance of depressed patients were not consistent with their unrealistically low self-opinion. Thus depressed subjects were found to be characterized by a limited number of deficits, particularly short-term memory and psychomotor speed, yet
the degree of impairment was relatively minor compared with the depressed patients' subjective experience of discomfort.

Breslow, Kocsis and Belkin (1980) investigated the memory ability of depressed subjects using the Wechsler Memory Scales (Wechsler, 1945). Depressed patients exhibited a deficit on almost all measures when compared with normal controls, leading the authors to conclude that depressed subjects exhibit a memory deficit relative to normals. However, five of the 21 depressed patients were tested during the initial stages of treatment with tricyclics. As there is some evidence that tricyclics may produce confusional episodes and memory disruption during the early phases of treatment (Davies et al., 1971), it is difficult to be certain that the results observed were due to the depressive episode rather than the effects of the medication.

Stromgren (1977) also used the WMS to investigate memory function in depression as part of a study examining recovery following ECT. Depressed subjects were found to display memory deficits prior to their first ECT, and exhibit a relationship between level or severity of depression and memory deficit. Not only were decreases in severity of depression related to improved memory functioning following ECT, but prior to this treatment severity of depression was related to memory deficits in the same manner. That is, the more severe the illness, the more severe the memory impairment.

Although these studies suggest that depressed patients may be characterized by some forms of cognitive dysfunction, the methods
and tasks employed tend to measure rather global constructs (i.e., 'memory' deficit as measured by the WMS). Further, by failing to include psychiatric control groups, these studies fail to demonstrate deficits specific to depression; thus these deficits may characterize psychopathology in general. Finally, there is some evidence that the more severe memory deficits were associated with more severe levels of depression. The relationship between severity of depression and memory deficits is deserving of further attention and will now be further developed.

Cronholm and Ottoson (1961) compared 45 depressed inpatients and 20 surgical controls on three tests; paired associates, figure recognition, and memory for biographical information. Subjects were again tested three hours later. Three scores were computed; immediate reproduction, delayed reproduction, and forgetting (the difference between the two testings). Depressed subjects scored significantly lower than controls on all measures of immediate and delayed reproduction, with no difference between groups with regard to forgetting. Results were interpreted by the authors as indicating that depressed subjects possess short- but not long-term memory deficits because all groups decreased their performance to the same degree in the delayed condition relative to the initial testing. This result suggests that information which is initially stored is retrieved equally for both depressives and normals. The difference between groups on the delayed reproduction test can be viewed as a reflection of the level of performance on the immediate reproduction test. If the individual is deficient on the initial
task it follows that less information will be available for retrieval in the delayed condition.

Patients were also tested on another occasion following a course of ECT. Interestingly, improvements in memory performance were found to be significantly correlated with depth of depression, similar to the results reported by Stromgren (1977). That is, the less severe the depression, the less severe the memory deficit. These results are consistent with an explanation of deficits in memory being severity related, such that the more severe the level of pathology, the greater the observed deficit. However, it is not known how ECT interacted with these results.

A number of other investigators have also found a relationship between severity of depressive pathology and memory deficits. Henry, Weingartner and Murphy (1973) examined short- and long-term memory deficits in a group of 25 bipolar and unipolar depressed patients while investigating the relationship between biogenic amines, memory and arousal. Subjects showed a long-term memory deficit while depressed when compared with their own scores while not depressed. No difference was observed between the two states for short-term memory. Further, severity of depression was found to be related to impairments in long-term memory, with higher levels of severity associated with greater recall deficits.

Sternberg and Jarvik (1976) examined the effect of tricyclic medication of short- and long-term memory in 26 depressed inpatients and 26 normal controls who were tested on two occasions, immediately prior to commencement of tricyclic therapy and 26 days
following initiation of pharmacotherapy. Depressed subjects were found to perform significantly lower than normal controls on all measures just prior to initiation of pharmacotherapy. At the second test session following 26 days of tricyclic medication, depressed subjects were broken down into three groups based upon degree of improvement in depressive symptoms. Subjects who showed the greatest improvement in their depressive state also showed the greatest improvement over their own scores for retention. The authors concluded that the memory deficits associated with depression are severity related and reversible upon recovery.

These studies suggest that the deficits associated with depression are transitory in nature and are directly related to the severity of the pathology present. Patients who are currently depressed may be characterized by transient memory and encoding structure deficits which disappear following symptom remission.

Thus, a relationship between severity of pathology and memory impairment has been noted (Stromgren, 1977; Cronholm & Otteson, 1961; Henry, Weingartner, & Murphy, 1973; Sternberg & Jarvik, 1976) such that the more severe the illness, the greater the memory deficit. This interpretation is further substantiated by Miller's (1975) comprehensive review of psychological deficit in depression, in which he concluded that the only differences noted between groups of depressed patients were attributable to severity of pathology (i.e., depression).

Investigators have also made preliminary attempts to further delineate the exact nature of the memory deficits associated with
depression. Weingartner, Cohen, Murphy, Martello and Gerdt (1981) in a series of three studies examined the method by which depressed patients process and organize information. In experiment one, 10 depressed inpatients meeting the RDC for unipolar depression and 10 nondepressed normal controls participated in a depth of processing paradigm (Craik & Lockhart, 1972). In this model information is considered to be variably processed at different levels of analysis, with more deeply processed information thought to result in a more permanent memory trace. Subjects were read a list of concrete nouns and were required to produce either a semantically or acoustically related response. Twenty-four hours later subjects were asked to recall as many of these words as possible. Following free recall, subjects were presented with their own verbal associates for each word and again asked to recall the previous days' list. Both groups were equally able to freely recall acoustically processed nouns. Both groups also evidenced robust increases in recall following presentation of their verbal associates as memory cues. However, recall of semantically processed nouns was impaired for depressed subjects compared to the normal control group in the non-cued condition. Although normals were better able to recall semantically than acoustically processed information, depressed subjects did not demonstrate this difference.

Experiment two consisted of these same subjects sorting two sets of 32 nouns into categories based upon a relationship between the words. One set of the 32 words was comprised of eight
superordinate categories, each containing four of the 32 nouns employed. The other set was made up of 32 taxonomically unrelated words. Following the subjective organization of the words, subjects were asked to recall as many of the words as possible. No difference between groups was found for either organization or recall of the list of words which included the eight superordinate categories. However, recall was inferior on the random list for depressed subjects even though depressed subjects were noted to impose more organization on this list than the normal controls.

Ten additional depressed inpatients and 10 normal controls participated in the third experiment. Seven lists of 32 words each were presented one at a time with the same instructions as in experiment two. The lists varied, however, with regard to number of categories and clustered versus unclustered presentation of related words within the list. Following subjective organization, subjects were asked to recall as many words as possible from the list just presented. Depressed subjects did not differ from controls on those lists which were highly organized and whose organization was demonstrated by obvious clustering. However, in those conditions where list structure was removed or not apparent, depressed patients recalled fewer words than controls. Finally, depressed subjects showed less sequentially organized recall than controls following presentation of unstructured lists, indicating inferior organization strategies.

Experiment one demonstrated that depressed patients were unable to take advantage of the more elaborate encoding produced by
semantic processing. Experiments two and three further demonstrated the depressed patient's ability to provide an efficient organization of material readily demonstrated to be related, but to be deficient when the organization was not apparent. The authors concluded that the common theme throughout this series of experiments was that depressed patients "failed to use encoding operations that would be useful in reorganizing input and that would then facilitate later recall" (p. 46). These results suggest that recall and memory deficits observed in depression may arise from structural deficits due to an inefficient subject-imposed organization. The importance of this set of studies is that they move beyond mere identification of the presence of a memory deficit into the realm of identification of the nature of the deficit. Again, however, the lack of a psychiatric control group prevents conclusions concerning the specificity of this deficit with regard to depressive group membership.

In fact, when appropriate psychiatric control groups are employed, there does not seem to be a memory deficit specific to depression. Davis and Unruh (1980) found no deficits in nonpsychotic depressed patients compared with nondepressed psychiatric controls. Thirty depressed and 30 nondepressed private practice patients participated in this study which assessed recognition memory, free recall, and subjective organization. No differences were found between depressed psychiatric patients and other psychiatric patients on these memory measures. These results
suggest that a depression-specific deficit does not exist. When depressed subjects are compared to appropriate control groups, they are found to have adequate memory. Only when the depressed group is most pathological, such as with long-term depressions, is a memory deficit obvious. Such a deficit would seem to be due to other dimensions besides the diagnostic grouping such as decrements associated with extended hospitalization which occurs in any mental disorder such as alcoholism or schizophrenia (Magaro, 1980).

To summarize, the simplest explanation of any memory deficits associated with depression would be that these deficits result from transient confusion and disorganization associated with psychiatric disorders. As such the reported memory deficits are actually an epiphenomena in that the specific memory process or deficit which is attributed to the diagnostic category of depression is actually a function of the effect of the pathology that accompanies the disorder. In other words, the memory deficit is due to episodic conditions rather than core processes. Or the resultant memory process is a state condition probably found in all mental disorders such as schizophrenia and is not unique to depression. For example, a recent review of the memory literature in schizophrenia (Magaro, 1980) finds the same memory organization problem as reported by Weingartner et al. (1981) suggesting the nonspecificity of this memory deficit which is possibly due to an inattention to the effects of the psychosis itself.
Memory and Cognition in Mania

Unlike depression, cognitive processes during the manic state have received little direct empirical investigation. In a recent review, McAllister (1981) reported only one study investigating cognitive functioning in mania. As noted by Henry, Weingartner and Murphy (1971) the paucity of research in this area is probably due to the difficulty inherent in testing individuals while in the manic state. Further, unlike depression, a manic-analogue paradigm is not available, hence further curtailing research in this area. Following is a review of studies found to exist in the literature whose primary purpose was to investigate cognition in mania, as well as reviews of the few reports investigating cognition in schizophrenia which used manic patients as controls.

Henry, Weingartner and Murphy (1971) tested seven bipolar inpatients during manic and nonmanic phases of their illness using a multtrial serial learning task, a random free recall task, and free association task. Subjects were rated for severity of mania at each test session; results were compared to those of a group of nine drug-free control subjects tested on one occasion. The bipolar patients learned fewer correct word pairs when manic than during their nonmanic control performance. No difference between controls and bipolars was found during the nonmanic period. Bipolar patients were also found to have poorer retention and give more idiosyncratic responses during their manic phase compared with the nonmanic phase. On all tests, decreases in level of performance were directly related to increases in severity of
mania.

These authors concluded that bipolar patients during the manic phase of their illness have a long-term memory deficit. Further, given the idiosyncratic nature of the associations produced during the manic state, Henry et al. (1971) concluded that the associational pattern of the manic is unstable, hence accounting for difficulties in retrieving information. Thus the long-term memory deficit found may be related to inefficient associational networks. Finally, these deficits were found to be reversible upon exiting the manic phase. These results are similar to those reported by the same group of investigators (Henry et al., 1973) in depressed patients, with the exception of a lack of idiosyncratic word association patterns. What these results suggest is that a relationship exists between manic thought disorder and memory, such that increases in severity of mania are associated with poorer learning and memory. The similarity between the deficits noted for manics and depressives suggests that global pathology rather than factors unique to either disorder may be responsible for these memory deficits (Chapman & Chapman, 1973). Additionally, the idiosyncratic or disorganized word association patterns found in manics suggests that severity of illness is directly related to structural disorganization. That is, the more severe the level of pathology, the more disrupted the cognitive structure. Again, it is not surprising that a highly disturbed manic individual will perform poorly on a memory test. The real test of a particular memory deficit is when the psychosis has passed. To date such a
deficit has not been identified.

Andreasen and Powers (1974) investigated overinclusive thinking (Cameron, 1944) in schizophrenia and manic patients. Overinclusive thinking is usually defined as "an inability to preserve conceptual boundaries...[leading] the schizophrenic to make remote associations and to overgeneralize or overabstract" (p. 452—Andreasen & Powers, 1974). Contrary to that hypothesized, manic patients showed significantly more overinclusive thinking than schizophrenics who were underinclusive when compared to normal controls. Again, evidence for the manics making remote or idiosyncratic associations has been found, further substantiating the findings of Henry et al. (1971).

Otteson and Holzman (1976) compared groups of schizophrenic, nonschizophrenic, psychotic, and nonpsychotic patients to a nonpatient control group on a variety of cognitive control measures, including the Rod and Frame Test, the Concealed Figures Test, Size Estimation Test, the Stroop Color-Word Interference Test, WAIS subscales, a Spatial Orientation memory Test, and a Schematizing Test. Manic patients were apparently included in the psychotic-other group. Although group differences emerged between psychiatric patients and controls, and psychotic and nonpsychotic patients, no differences between schizophrenic and other psychiatric patients were observed. The authors interpreted these findings as suggesting that no set of specific cognitive characteristics existed for schizophrenic patients. Differences observed were related to level of disorganization, rather than to
types of disorganization. In the authors' words, "...it is reasonable to assume that such impairment results from general organismic disequilibrium that is not specific to any particular diagnostic group" (p. 138).

Selective attention was investigated in 12 schizophrenic, 12 manic and 12 normal controls by Oltmanns (1978) using a digit-span task, and four word-span recall tasks. Word-span 1 consisted of eight words read under a neutral condition, and eight read under a distractor condition (irrelevant words read between each relevant word). Schizophrenic and manic patients were found to be more distractable than normal controls, but not to differ from each other. Again, as was the case with the results reported by Otteson and Holzman (1976), distractability appears to be related to the presence of thought disorder rather than to specific diagnostic categories. Thus, these results provide further support for the notion that cognitive dysfunction in mania is related to global pathology.

Although the literature concerning cognitive processes in mania can be said to be sparse at best, some general conclusions with respect to this topic can be made. First, as with depression, the deficits associated with mania appear to be severity related and reversible upon recovery. Second, when compared with appropriate psychopathological control groups, such as schizophrenics, manics appear indistinguishable from these groups. These results suggest that cognitive deficits in the manic phase of bipolar illness are related to disorganization associated with
pathology rather than characterizing the specific pathological entity, mania. As concluded by Harrow, Grossman, Silverstein, and Meltzer (1982) following a comparison of manics and schizophrenics for presence of thought disorder, "...the similarities in clinical picture between the manic and schizophrenic patients could support formulations about a general psychosis factor...with this factor cutting across various types of psychotic diagnoses" (p. 670).

Non-Cognitive Factors

Investigators have also focused upon "non-cognitive" determinants of memory performance in depression. Effort and response bias have been the two major dimensions examined. The results suggest that these psychological processes are most affected by level of pathology, which in turn produce what appear as memory deficits.

Effort. Cohen, Weingartner and their colleagues (Cohen, Weingartner, Smallberg, Pickar, & Murphy, 1982) investigated whether a general motivational deficit may be responsible for memory deficits found in depression. Eleven depressed inpatients and five normal controls participated in a two-part investigation into the relationship between effort, severity and short-term memory. Sustained effort was measured using a hand-held dynamometer, while severity of the depression was measured using the Profile of Mood States (POMS-Guy, 1976), the Hamilton Rating Scale for Depression (HRS-Hamilton, 1967), the Beck Depression Inventory (BDI-Beck et al., 1961) and the Bunney-Hamburg ward
rating scale (Bunney & Hamburg, 1963).

Results indicated a significant negative correlation between severity of depression and sustained effort; as severity of depression increased ability to sustain effort decreased. Similarly, increases in memory performance were correlated with severity of depression; the more severely depressed the greater the memory deficit. Finally, effort and memory were found to be positively related, with better memory performance associated with longer periods of sustained effort. These results suggest that memory and effort on a motor task are proportionate to severity of depression; the more severely depressed the patient, the poorer the sustained effort and recall. Conversely, the better the ability to sustain effort, the better the score on recall. Therefore, the memory deficits observed in depression may in fact be a function of motivation or degree of pathology which also decreases effort. Effort is crucial to a memory task because of the importance of rehearsal in increasing memory performance. Permanence of a memory trace is affected by rehearsal and consolidation following exposure to the to-be-remembered stimuli (see Crowder, 1976 for a review). Given that such mental processes require the expenditure of effort, the inability of depressed patients to sustain effort may result in the memory deficits noted.

By demonstrating the existence of a relationship between effort and recall as well as between severity and recall, the authors may have actually discovered the mechanism through which memory processes are decreased in depression. That is, the
relationship between lack of effort and memory may actually be why severity is related to memory deficits. The more pathological the less effort expended and hence the greater the memory deficit. Given the correlational nature of this study, causal effects can not be established and we can only guess at what comes first. However, it does seem logical that degree of pathology would decrease effort rather than effort increasing level of pathology even considering the effect of another common variable. An adequate test of the effort hypothesis would not only involve the inclusion of a psychiatric group in order to control for global pathology, but would also need to be demonstrated in a group of nonpsychiatric controls with similar low levels of sustained effort.

Response Style. Regardless of what information is stored in the memory system, willingness to report on the part of the subject may affect estimates of the memory deficits associated with depression. Whitehead (1973) compared the performance of depressed inpatients and demented subjects on a variety of short- and long-term memory tasks. An analysis of the types of errors committed indicated that depressed subjects tended to make more transposition errors or failed to respond, whereas patients with dementia occasionally produced irrelevant answers. The occurrence of omission errors suggests a conservative response style, which was further investigated by Larner (1977). Demented, depressed and physically ill patients were examined with regard to short- and long-term memory deficits. Each subject was administered the Mill
Hill Vocabulary Scale, the Digit Span Forward from the WAIS, a synonym learning task, and a continuous false recognition task. Larner replicated the Whitehead (1973) results finding that subjects with dementia performed more poorly on the memory tasks than depressed patients and nonpsychiatric controls. More relevant to this discussion was Larner's signal detection analysis which indicated that depressed and physically ill patients adopted a conservative response strategy compared to the demented group. Although the difference between depressed and physically ill subjects did not reach significance, the hypothesis was forwarded that depressed patients could be characterized as cautious or non-responsive even when they possessed the correct response.

Miller and Lewis (1977) directly compared the response style of depressed and demented patients using signal detection analysis. Twenty elderly demented, 20 depressed and 20 normal subjects were tested using the Continuous Recognition procedure (Kimura, 1963), which allows for the computation of d' (discriminability) and beta (decision strategy). Depressed and normal subjects were found not to differ on d', suggesting that the pure memory functions of depressed patients as measured by this task were as efficient as those of the normal controls. However, depressed subjects used the most conservative strategy as evidenced by the beta criterion. Thus, although depressed patients did not manifest a deficit with regard to pure memory functions, this group was shown to adopt a conservative response strategy, consistent with the results reported by Whitehead (1973) and by Larner (1977).
It appears then that depressed subjects adopt a conservative response strategy in making decisions on various types of memory tasks. Thus, from another perspective, these results also suggest that deficits observed in depressed patients may not actually exist whereas we have considered that the observed memory deficit may be due to confounding factors such as level of pathology, medication, extended hospitalization, etc.; these results suggest another factor inherent in the decision making processes. Depressed subjects may have the correct answer stored in memory but due to a conservative response strategy be unwilling to communicate the answer to the experimenter. Here we have no thought disorder or deficient memory structure but simply a decision to respond at a particular level of confidence. The choice to respond conservatively may be due to the pathology itself, that is, not wishing to display the confusion inherent in the pathology. This may be the reason why the memory deficit seems so strongly related to severity. The depressed individual may realize his/her level of confusion and modulate its expression by choosing a nonrevealing conservative response strategy that minimizes the expression of the pathology but which does produce a deficit on the dependent variable, in this case the memory measure.

Summary

The search for deficits specific to depression and mania has produced a number of results. First, we have seen that memory deficits appear to be severity related, such that the more severe the symptomatology the more disrupted the memory processes.
Additionally, these deficits appear to be reversible, suggesting that changes which accompany a depressive episode are limited to the duration of the illness. Ability to sustain effort has been linked to severity and memory deficits; the more severe the symptoms the less sustained effort, resulting in a greater memory deficit. Further, response bias has been demonstrated to be at work such that a conservative response bias may modulate performance and account for the apparent memory deficit. If such is the case, much of the research assumed to be demonstrative of structural memory deficits may in fact be due to the pathology itself or the response style adopted by the depressed patient in response to the pathology. Further implications of this interpretation of memory deficits in depression will be presented following the next section of this paper which is concerned with cognitive content in depression.

Cognitive Content in Depression

The majority of investigations examining content of thought in depression have been derived from Beck's (1967) cognitive theory of depression. To date this work has focused almost exclusively on schematic processes in depression. It will be necessary to first present a brief overview of schema theory especially in terms of how schema are activated in order to interpret the work reported in the affective disorder literature.

Schema. Schemata are generally considered to be hypothetical cognitive structures that represent associations among lower level units of information, resulting in higher-level meaningful units.
Alba and Hasher (1983) state that schemata produce "coherent, unified, expectations confirming and knowledge-consistent representations of an experience" (p. 203). Thorndyke and Hayes-Roth (1979) have listed the following as common properties of schemata: 1) prototypical abstractions of complex concepts which they represent; 2) arise from past experiences with examples of the concept; 3) guide the organization of incoming information; and 4) when a concept of a schema is missing from input information its presence can be inferred from the prototype (schema) present. Thus schemata are considered to be organizations of and associations between concepts which guide and direct the encoding of new information.

Given that schemata determine what information is processed and how it is stored, such processes can and usually do produce memorial inaccuracies. Alba and Hasher (1983) have described four schematic processes which may be responsible for the distortions produced: 1) selection, which determines which aspects of available information will be selected for processing; 2) abstraction, responsible for the storage of the meaning of a message without reference to original syntactic or lexical content; 3) interpretation, which converts explicit statements to underlying meaning, or fills in missing detail and simplifies complex information; and 4) integration, which is thought to be the culmination of the selection, abstraction and interpretation processes, resulting in a holistic organization of material in memory.
The accessibility of a schema can be stated as the probability that it will be activated. This activation is dependent upon the strength of the stored information, the match between input and the schema, and the recency and frequency of previous activations (Thorndyke & Hayes-Roth, 1979). Schema strength is thought to be positively related to frequency and recency of activation, with weak schemata benefiting from repeated activations more than relatively strong schemata (Thorndyke & Hayes-Roth, 1979). The manner in which schemata are activated has been examined and reviewed by Higgins and King (1981). Activation can be thought of as being dependent upon expectations and motivation, which interact with recency and salience of a construct. Thus the state of the organism with regard to motivational and emotional factors contribute to the likelihood of activation.

**Self-Schema in Depression.** The role of schematic processes in psychopathology has focused mainly upon the affective disorders, particularly depression. Beck (1967) considers the depressed patient to possess a negative cognitive triad, consisting of a negative view of the self, the future and the world. Depression is therefore viewed as a cognitive disorder in which affective, motivational and somatic complaints are secondary manifestations of a cognitive process, typified by cognitive distortions, such as overemphasis on failure, or feelings of guilt and responsibility for events beyond their control.

Beck defines schemata as stable cognitive structures which determine how an individual processes information. Kovacs and Beck
(1978) have expanded this position, further postulating that depressive schemata are latent cognitive structures which are stable and present early in life. These depressive schemata are hypothesized to arise from early loss of a parent or via modeling of an inadequate parent. The depressive schema is thought to be activated later in life by conditions resembling those present at the time of the schema's development, e.g., loss of emotional support in a romantic situation resembling loss of emotional support from a parent early in life.

Once activated, the negative thoughts associated with the depressive schema lead to dysphoria, reduced desire to provide for one's welfare and pleasure, and ultimately, to giving up (Kovacs & Beck, 1978). This negative self-schema activates themes of inadequacy, self-blame and negative expectations. In addition, the schema organizes incoming information in such a way as to be consonant with these negative thoughts and feelings.

Davis (1979a) was among the first to examine schematic processes in depression. A modified version of the depth of processing paradigm proposed by Rogers, Kuiper and Kirker (1977) was employed in this study. This paradigm includes four levels of processing, each related to a different depth of processing as manifested by recall ability. The first three levels were based upon the work of Craik and Tulving (1975) and involve the rating of adjectives for three different qualities: structural (is the word long or short?), phonemic (does the word have a rhyming sound?) and semantic (is the word meaningful to you?). The deepest level of
processing is produced by the semantic judgment, the shallowest by
the structural, and the intermediary position is occupied by the
phonemic judgment. Rogers et al. (1977) appended a fourth
judgment, self-reference (does the word describe you?), which was
found to produce stronger memory traces (taken as indicative of
deeper processing) than the other conditions.

Davis's (1979a) rationale for employing this paradigm was that
self-reference judgments may provide an indicator of the efficiency
of the self-schema, such that recall of self-reference words
results from their "fit" with a pre-existing memory structure, or
schema. Thus individuals with a well organized self-schema should
demonstrate superior recall for self-reference adjectives than
those with poorly organized or disorganized self-schemata.

Depressed subjects and normal controls were administered the
BDI and then presented with a list of adjectives which subjects
rated on one of the four levels of processing tasks. In addition
to comparing depressed to normal subjects for these conditions, the
effect of length of depression on self-reference judgment recall
was also examined in the depressed group.

Davis hypothesized that depressed patients would not exhibit
higher recall for self-reference word judgments than for those
words encoded at the semantic, phonemic or structural levels. The
reasoning behind this hypothesis being that short-term depressed
patients may possess a poorly organized self-schema as a result of
little experience with depressogenic expectations and beliefs. He
further hypothesized that strength of recall for the self-reference
judgment would be linearly and positively related to length of depression. The assumption here was that the reorganization and development of a well-organized self-schema occurs over time as one has more experience with the inappropriate (depressive) schema. Thus, the longer one is depressed, the more experience with the depressed processing style (schema), resulting in a more organized self-schema which is demonstrated by better recall of self-reference adjectives.

The results of this study supported both of the hypotheses; ability to recall self-reference judgment words was positively related to length of depression in the depressed group. While depressed patients recalled fewer self-reference words overall when compared with the nondepressed group; no differences between groups on the semantic, phenomic or structural judgments were found. This result supports the previously discussed work on memory structure in that there are no memory deficits in depression. The only deficits reside in particular content areas in memory. The interpretation is that the self-schema is not as integrated for depressed relative to nondepressed subjects, and that the self-schema develops over time as one becomes more familiar with evaluating the self and the world using negative cognitive processes. Davis also noted that severity as measured by the BDI accounted for little of the variance, concluding that severity of depression was not related to memory for self-descriptive words. Thus, although severity will effect memory structure measures such as recall, it does not effect content measures.
Following this initial effort, Davis (1979b) further examined the development of self-schema in depression using a somewhat different paradigm. Davis reasoned that another means by which to investigate whether a person uses a schema to organize information about the self would be to assess subjective organization of self-descriptive words during a multiple trial free recall procedure. Davis explains this rationale as assuming that if a person has an "organized and stable self-description...it is likely that they have also developed schemata to represent the relations among self-reference adjectives" (p. 417).

Depressed (score of 5 or greater on BDI short-form) and nondepressed female undergraduates were tested for incidental recall, multitrial free recall and final free recall on adjectives and abstract nouns. Subjects were instructed to make either a semantic or self-reference judgment for the adjectives and to make a structural judgment of the abstract nouns. Subjects were further asked to rate the adjectives along a seven point Likert-scale as to how descriptive each word was of her. Following this initial identification of adjectives relevant for self-reference, three groups of words (self-descriptive, moderately self-descriptive and abstract nouns) were presented for free recall. Final recall followed completion of two simple math problems given immediately following the last trial. Clustering of words over trials was compared between the two groups.

Results were in line with those reported earlier (Davis, 1979a), indicating that the depressed subjects showed less
subjective organization for all three word groups than nondepressed subjects. Additionally, level of depression was inversely related to subjective organization in the high self-reference group only; the more depressed the individual the less clustering upon recall. Again, Davis interpreted these findings as suggesting that short-term depressed individuals do not possess stable self-schema.

Unfortunately, this was an analogue study where subjects were college students designated as depressed by the BDI, a practice which, as we have discussed, is not considered representative of depressive processes. What is a prime example of this problem is the results where level of symptomatology as identified by the BDI was related to organization of subjective recall. In the earlier study (Davis, 1979a) using clinically depressed patients, Davis found no relationship between the BDI score and recall of self-reference words suggesting that mood (as measured by the BDI) is not important in the disorganization of the depressive self-schema. Either the results are directly contradictory or, more likely, there is a qualitative difference between clinically depressed and analogue subjects (Depue & Monroe, 1978a).

In a more recent, related study, Davis and Unruh (1981) examined more closely the relationship between length of depression and stability of the self-schema utilizing the subjective organization multiple trial free recall paradigm. Depressed patients identified by the BDI and meeting Feighner et al. (1972) criteria were compared to nondepressed private practice patients. Depressed subjects were asked to estimate the length of their
illness and were then further divided into two groups of 15 based upon a median split for duration. Results indicated that short-term depressed patients had lower subjective organization of self-descriptive adjectives than either the long-term depressed or nondepressed subjects, while the latter two groups did not differ significantly from each other. These data were taken to suggest that the self-reference schema is in a state of transition for the short-term depressive, which over time becomes stable, being comparable to nondepressed levels of organization. It was further hypothesized that long-term depressed patients, like nondepressed patients, are more familiar with a stable self-schema than are short-term depressed patients.

A closer examination of this report raises some interesting issues. First, Davis and Unruh (1981) reported that the short-term depressed subjects were lower on subjective organization of self-descriptive adjectives than either long-term depressed or psychiatric subjects. Yet in their 1980 study examining word memory in nonpsychotic depression, Davis and Unruh report exactly the opposite result. At first glance, the discrepancy appears to be due to the authors dividing the self-descriptor adjectives from the 1980 report into high and moderate categories in the 1981 report. That is, adjectives used in the first report were analyzed together, whereas in the second report those same adjectives were then divided into two groups based upon subjects' ratings of how well each word described them.
However, the results reported in both the 1980 and 1981 reports are derived from the same data which was merely reanalyzed using these different categories. It is also interesting to note that Davis and Unruh (1981) make no attempt to explain the discrepancy between the 1980 and 1981 studies; in fact, the earlier study does not even receive mention in the 1981 report. Additionally, as well as these studies reporting conflicting results derived from the same subjects, these subjects were culled from an earlier report (Davis, 1979a)—thus what appears to be three independent tests of their hypotheses are in fact different analyses of the same data. It is also unclear why words rated as highly self-descriptive should show less subjective organization than moderately self-descriptive words: if in fact low levels of subjective organization characterize unstable self-schemata, one might expect both high and moderate self-descriptors to be poorly organized by short-term depressed patients.

A final point, Davis and Unruh (1980) found no difference between short-term depressed, long-term depressed and psychiatric control patients for age, means being 34.40, 29.20 and 30.87, respectively. However, even though subjects were the same for both studies, age differences were reported in the 1981 Davis and Unruh report, with short-term depressed patients now said to be 43.40 years old. One is left with the uncomfortable feeling that other such data transpositions and errors may have occurred, raising the possibility that differences between these two studies with regard to subjective organization may have resulted from computational
errors. Transposition in a table is one thing, but to actually obtain statistical differences suggests difficulties beyond the mere switching of numbers in a table. Until these results are verified by an independent laboratory, they should be taken as suggestive at best. Thus it may be more accurate to hypothesize a relationship between length of depression and organization of the self-schema rather than concluding (as do Davis & Unruh) that such a relationship exists.

Derry and Kuiper (1981) have also investigated the self-schema in depression. These authors noted that depressed patients have been characterized as having a negative self-image (Beck, 1967). Given the presence of this negative self-image, these authors reasoned that adjective content would be an important determiner of retention of self-descriptive adjectives. Thus the nonpathological nature of the adjectives used by Davis would not tap the existence of a negative or depressive self-schema in depressed patients. Derry and Kuiper (1981) attempted to examine this hypothesis by manipulating the content (depressed vs. nondepressed) of self-descriptive adjectives in a paradigm similar to that used by Davis (1979a).

Unipolar depressed, nondepressed psychiatric, and normal nondepressed females participated in this study. Cutoff scores on the BDI, the Hamilton Rating Scale for Depression (HRS) and the Feighner et al. (1972) criteria were used to select subjects for each sample. Depressed and nondepressed content adjectives were chosen as stimuli based upon the ratings of an earlier normative
sample of undergraduate judges. Ten words from each group received a structural rating (is the word in small letters?), 10 from each group received a semantic rating (does the word mean the same as 'word'), and 10 from each received a self-referent rating (does the word describe you?). Following this rating task, subjects were to recall the words and were also asked to rate additional adjectives on how well the word described them, and how well it would describe a depressed person.

Results of this study indicated superior recall by the depressed subjects for depressed content words that they rated as describing themselves. Both nondepressed groups recalled more self-reference, nondepressed content words than the depressed group. No difference between groups for number of words recalled overall was noted, nor were any reaction time differences observed.

These data suggested that depressed patients utilize a self-schema in information processing which differs in content but not in structure from that of nondepressed individuals. Derry and Kuiper (1981) hypothesized that a mechanism which could explain these results was that depressed subjects may have recalled depressed content self-reference adjectives because they were congruent with their affective state (mood). Thus, the depressive self-schema was demonstrated to be content-specific (i.e., depressed content) as well as structurally sound (i.e., no difference in reaction time or overall recall). Finally, mood-state was hypothesized to account for activation of this schema.
Further scrutiny of the data reveal an interesting relationship between level of depression and recall of depressed self-referent words. As would be expected, on both the BDI and the HRS, depressed subjects indicated significantly higher levels of depression in relation to both the psychiatric and normal controls. As also what may be expected, the psychiatric control group occupies an intermediary position between normal and depressed subjects. Of interest, however, is that the nondepressed psychiatric controls also occupy this intermediary position with regard to recall of depressed and nondepressed content words. Thus, psychiatric controls who manifest moderate levels of depression also recall more depressed content and less nondepressed content words than controls. A conclusion that can be drawn from this relationship is that mood-state, regardless of diagnosis, may play the determining role in recall of self-referent words, moreso than group membership. As noted previously, lack of psychiatric controls has plagued this literature. Derry and Kuiper's (1981) inclusion of such a group reveals an interesting relationship between severity or degree of depressed mood and memory of particular content words. However, neither mood nor severity can be specified as the variable affecting performance as measures of both were related to memory performance.

Following their initial study examining self-reference in depression, Kuiper and Derry (1982) investigated retention for depressed versus nondepressed content adjectives in groups of mildly depressed and not depressed undergraduates (as determined by
the RDC and the MAACL) in order to ascertain the effect of depth of 
depression on schematic function. If mildly depressed individuals 
demonstrate superior recall for self-reference words of depressed 
content only, then it would appear that any depressed individual 
utilizes a depressed-content self-schema and it is not a function 
of pathology or severity of the disorder but is more determined by 
the mood state of the individual. Results indicated that 
nondepressed undergraduates remembered more nondepressed than 
depressed self-referent words, while depressed undergraduates 
remembered equivalent numbers of both depressed and nondepressed 
content words. These results suggested that mood level plays an 
important role in the organization of the self-schema. Thus mildly 
depressed individuals incorporate both depressed and nondepressed 
content self-descriptive adjectives into their self-schemata, 
suggesting that the self-schema of mildly depressed individuals 
does not share the pervasive negativity of a clinical group of 
severely depressed patients.

This interpretation is in line with that offered earlier 
concerning Derry and Kuiper's (1981) prior report, that mood level 
regardless of diagnostic category is related to recall of depressed 
content words. Contrary to the Derry and Kuiper (1981) contention 
that severity accounts for differences between their clinical group 
(severe) and student group (mild) in terms of self-schema function, 
is the interpretation that the results may in fact be due to the 
common dimension in each study, degree of depressed mood.
Most of the studies reviewed to this point suggest that mood plays an important role in memory processes, particularly short-term memory content. The results with undergraduates (Kuiper & Derry, 1982; Davis, 1979b) suggest that rather than diagnostic specificity (clinical depression) being crucial as a determinant of memory content, depressed mood as measured by the BDI may be the critical dimension. Further evidence bearing upon the relationship between mood and memory will now be presented.

**Mood-State-Dependent Learning**

One aspect of memory function which has received little empirical attention in the affective disorders is mood-state-dependent retrieval in memory. State-dependent learning and recall has been demonstrated in a variety of human and animal studies. These studies typically consist of the learning of some behavior following the administration of a drug compound, followed by testing for the retrieval under drug and non-drug conditions (Goodwin et al., 1969; Deutsch & Folie, 1973; Swanson & Kinsbourne, 1976). Results have indicated that recall of information or repetition of behavior learned in a specific drug state is more easily recalled or performed in the same state.

Based upon these findings and results from their lab concerning state-dependent influences upon information processing (Henry, Weingartner, & Murphy, 1973; Murphy, Henry, & Weingartner, 1973), Weingartner, Miller and Murphy (1977) investigated mood-state-dependent retrieval of information in eight bipolar patients
who cycled between depressed, manic and normal mood states. Over this time period subjects were presented with two stimulus words per day at four day intervals and asked to generate twenty free-associations to each word as well as recall their associations generated from the previous session.

Results indicated that retrieval was most efficient when associations were reproduced in the same state as that in which they were originally produced. Thus, as with drug studies of state-dependent learning, mood state was demonstrated to be important with regard to retrieval of information. As the authors point out, these results may be interpreted in light of context-specific encoding, with the context in this case being defined as the mood-state which if present at recall enhances retrieval. Conversely, mood-incongruence between encoding and recall decreases retrieval efficiency. The effect of mood-state-dependency on recall will be considered when the effect of emotion on recall is more fully considered later in this paper.

Emotional State and Recall

Lloyd and Lishman (1975) have focused directly upon the relationship between memory, mood and severity. They asked if affective states (mood) differentially affect recall of memories from one's own past, such that memories concordant with the affective state will be recalled more than noncongruent memories. Depressed inpatients were examined for speed of recall for pleasant and unpleasant life-events. They were read two lists of words each with the instruction to recall either a pleasant or unpleasant
experience which came to mind after hearing the stimulus word. Some weeks to months later, the patients who were judged to be clinically improved by their physician were again tested using the same paradigm.

Contrary to results obtained from normal subjects (Lishman, 1972a), depressed patients did not recall pleasant memories more quickly than unpleasant. They did however find a strong relationship between severity of depressed mood as measured by the BDI and speed of recall of pleasant versus unpleasant events; the more depressed the patient the more readily accessible an unpleasant memory compared to the pleasant memory. This relationship was again borne out at the second testing.

These results suggest that accessibility of memories for past events is affected by mood. Past events whose hedonic tone matched that of the individual at the time of recall were more likely to be recalled than events not matching the individual's mood. Also, the sadder the mood, the shorter the latency for recall of the unpleasant event. Thus, mood-state can be seen to determine accessibility of memories from long-term memory.

More recently, Clark and Teasdale (1982) investigated the role of mood in the recall of past events in depressed psychiatric inpatients exhibiting diurnal mood variations. Subjects were tested at the least and most depressed phases of their cycle. On both occasions subjects were presented with a list of stimulus words and were instructed to recall a real-life experience brought to mind by the word. Response latencies and hedonic quality of the
event (how subjects felt about the experience at the time it occurred and how they felt about it at the time of testing) were recorded for each test session.

Memories for unhappy events were found to be more accessible when tested at the most depressed occasion than on the least depressed. Conversely, happy memories were more likely to be recalled when tested on the least depressed occasion than on the most depressed occasion. Again, mood-state was demonstrated to be an important determinant for recall of information, such that memories with hedonic tone congruent with mood at recall are more readily accessible.

Breslow, Kocsis and Belkin (1981) also found evidence for negative selectivity in memory using a sample of hospitalized depressed patients and matched controls. Subjects were read a short story containing positive, negative and neutral themes. Depressed subjects were found to have an overall deficit for recall compared to normal subjects. However, comparison of memory for the different themes indicated that depressed subjects recalled 20% less positive themes than did the normal group.

Taken together, this last set of studies suggest that although the self-schema in depression is specific (i.e., negative) in content, the crucial factor is not the diagnostic category but the mood-state. Mood accounts for recall of negative content words within depressed groups as well as other diagnostic groups. For instance, non-depressed psychiatric controls manifesting moderate levels of depressed mood recall more depressed content words than
do non-depressed normals (Derry & Kuiper, 1981).

Clark and Teasdale (1982), Lloyd and Lishman (1975) and
Weingartner et al. (1977) directly demonstrated the relationship between memory and mood-state. The retrieval of memories congruent with mood-state are more easily recalled than those that are incongruent. It is therefore logical to assume that mood-state would operate in like manner within a recall paradigm which employs words with affective (mood) content, such as that employed by Derry and Kuiper (1981). It also appears that the activation of negative self-schema is contingent upon mood state.

In conclusion, a number of qualities of depressive cognition with regard to schematic functioning may be enumerated. The depressive self-schema seems to be content specific, being selective of negative content adjectives for describing the self. However, mood appears to be most important for determining selectivity of memory for past events, with individuals indicating more depressed mood demonstrating enhanced recall of negative versus positive life events. Depressed patients appear to manifest content-specificity with regard to encoding and remembering of events based upon their hedonic tone. Memories which are consonant with the emotional state (mood) at the time of recall are more readily retrieved than are disconsonant memories. However, one is struck by an alarming trend in this literature, consisting of the use of analogue subjects. Many of these studies have made conclusions about the major affective disorders based upon results obtained from a handful of undergraduates who may only have been
experiencing a transient mood state. A more adequate conclusion regarding this literature may be that the content of clinically depressed subjects' memories and self-schemata are similar to those of normals experiencing a transient mood-state. Thus, mood-states may produce content-specificity in memory regardless of whether one is currently ill or free of psychiatric illness. If mood state can be considered oblique to diagnosis, one would expect that, regardless of diagnosis, individuals currently experiencing similar mood states will exhibit similar content with regard to memory.

Memory in Schizophrenia

Cognitive processes in the schizophrenic disorders have received a great deal of attention (Lang & Buss, 1965; Cromwell, 1975; Neale and Oltmanns, 1980; Magaro, 1980; 1984). A review of these many and varied contributions to our understanding of schizophrenia is beyond the intent and scope of this paper. Given the focus of the present investigation upon memory processes in the affective disorders, this section reviews recent literature investigating similar processes in schizophrenic patients. That is, memory deficits and processes associated with schizophrenia will be summarized, providing a backdrop against which to view the later discussion of the results of this study.

Much attention has been devoted to examining the differences noted between the recall and recognition memory of schizophrenic patients. In an early investigation examining the role of overinclusive thinking in schizophrenia, Bauman and Murray (1968) compared the recognition and recall memory of 24 schizophrenic
patients (11 paranoid and 13 nonparanoid) and 24 normal controls. To-be-remembered stimuli consisted of two 20-word lists. The test of recall memory consisted of the presentation of one of the lists at a rate of 3 seconds per word followed by a free recall period during which time subjects wrote down as many words as they could remember. The recognition task consisted of the presentation of the second 20-word list, followed by presenting the subject with a list of 80 words containing the 20 target words and 60 distractor words. Although normal subjects recalled significantly more words than schizophrenic patients, groups did not differ on the recognition task. The authors concluded that schizophrenic patients have little trouble with the acquisition stage of memory, but that schizophrenic patients have difficulty with the association stage of memory, which lead to the recall deficit.

Nachmani and Cohen (1969) also investigated recall versus recognition memory in schizophrenic patients compared to both normal controls and a group of "anxiety neurotic" psychiatric controls. Two 15-word lists consisting of words from two conceptual categories were presented three times each. Following each trial, subjects were given either a free recall or recognition memory test. The performance of the schizophrenic patients was inferior to both psychiatric and normal controls on recall trials, but not on recognition. These results are consistent with those reported by Bauman and Murray (1968) regarding the differential recall deficit in schizophrenic patients. Further, the inclusion of a psychiatric control group suggests that the schizophrenia
recall deficit is not merely a result of having a psychiatric disturbance. Finally, the fact that lists contained an internal or superordinate structure (i.e. word categories) further suggests that the schizophrenia recall deficit may be due to an inability to efficiently utilize conceptual cues present at the time of encoding. That is, schizophrenic patients appeared not to have taken advantage of the organizational properties of the lists.

In a series of two follow-up studies, Bauman (1971a; b) further investigated the difference between recall and recognition memory in schizophrenic patients. Bauman (1971a) hypothesized that the association deficits leading to poor recall for schizophrenic patients were the result of an inability to utilize stimulus cues present at the time of encoding. Twenty-four schizophrenic patients were compared to 24 normal control subjects for recognition versus recall memory as a function of the organization of the to-be-remembered stimuli. Four blocks of 8 lists of letters were constructed, half consisting of random letter combinations and half consisting of CVC sequences: CVC sequences were considered to be the organized stimulus condition while random letter sequences were considered to be the unorganized condition. Results indicated that both groups remembered more organized than unorganized sequences, with normal subjects making more correct responses overall than schizophrenic patients. Thus schizophrenic patients appear to take advantage of the inherent structural properties of each member in a stimulus set (list) in a manner similar to normal subjects, suggesting that the recall deficits
noted for schizophrenics is not due to a cue utilization inability. When considered in conjunction with results reported by Nachmani and Cohen (1969), these results suggest that although schizophrenic patients make more efficient use of stimuli characterized by intrastimulus organization (e.g. CVC trigrams vs. random letters), they fail to benefit in the same manner as normal or psychiatric control subjects from interstimulus organizational properties.

In a further attempt to elucidate the causal factors associated with the schizophrenic patients recall deficit, Bauman (1971b) compared 24 schizophrenic patients to 24 normal controls examining the effect of organizational cues on recall performance. Subjects were given three trials on two 10-item lists of CVC trigrams. Following each presentation, subjects were given either a free recall or recognition memory test. Half the subjects in each condition were given the organizational cue, which consisted of informing subjects that each trigram began with a different letter of the alphabet, and that attending to this aspect of the stimuli would aid in recall. Results demonstrated that schizophrenic subjects who received the special instructions did not recall more words than those who did not; while normal subjects did manifest such an increase between the instruction and non-instruction conditions. In the recognition condition, special instructions did not enhance the performance of either normal or schizophrenic subjects. Thus special instructions were found not to enhance the recall of schizophrenic patients while they did enhance the recall performance of normal subjects. Bauman
concluded that the recall deficit characterizing schizophrenic patients results from a difficulty chunking or organizing information in semantic memory.

Taken together, these studies suggest that schizophrenic patients are characterized by a recall but not recognition memory deficit when compared to both normal and psychiatric subjects. Further, this deficit appears to be due to inefficient encoding strategies, resulting in poor memory organization and hence poor recall performance.

Based upon Tulving's (1972) conclusion that recall memory is more likely to involve semantic memory while recognition memory involves episodic memory, Johnson, Klinger and Williams (1977) hypothesized that schizophrenic patients would not manifest episodic memory deficits compared to normal and psychiatric controls. Episodic memory was measured using the public events questionnaire (Johnson and Klinger, 1976) which consists of multiple choice questions about significant historical events. Results confirmed the hypothesis, with schizophrenic subjects performing as well as psychiatric and normal controls, suggesting that the episodic memory of schizophrenic patients, at least with regard to memory for historical events, is intact.

In a series of studies at the Michael Reese Hospital, Koh and his colleagues have investigated the structural properties of the recall and recognition memory of schizophrenic patients. Koh, Kayton and Berry (1973) compared the properties of recall and recognition memory of schizophrenic patients in two experiments.
Twelve nonpsychotic, nonparanoid schizophrenic patients, 12 nonschizophrenic psychiatric patients (mostly depressed), and 12 normal control subjects were contrasted on two 20-word lists over nine presentation trials, with one list being comprised of 20 unrelated nouns (uncategorized) and the other consisting of 20 words from one of five conceptual categories (categorized). Normal subjects recalled more than schizophrenic subjects in both conditions (categorized and uncategorized) while recalling more than nonschizophrenic patients in the uncategorized condition only. Schizophrenic patients did not differ significantly from nonschizophrenic patients in either condition. The subjective organization, category clustering, and hierarchical clustering schemes were computed for each group and compared. Normal subjects were characterized by the highest level of inter-trial repetition (ITR), with nonschizophrenic patients occupying the intermediate position and schizophrenic patients the lowest. The ITR measure (Bousfield & Bousfield, 1966) is an index of subjective organization across trials as manifested by contiguous recall of words across trials. However, schizophrenics were inferior to normal and nonschizophrenic patients on the categorized list only, with no differences between groups on the uncategorized list. On the categorized list, normal subjects showed more categorical clustering (contiguous recall of words from the same category) than both patient groups who did not differ from each other. Finally, schizophrenic subjects manifested more peculiar clustering together of words on the uncategorized list than both normal and
nonschizophrenic patients, but did not differ from either group on the categorized list, with all groups utilizing the conceptual categories. Taken together, these results suggest that the recall deficit of schizophrenic patients is probably due to deficient organizational strategies at encoding, but this difference is probably one of degree rather than being qualitatively different.

In experiment 2, the performance of 20 schizophrenic patients and 20 normal controls was compared on two recognition tasks; the first consisting of two trials of English words, and the second consisting of three trials of CVC trigrams. Results demonstrated that the recognition memory of schizophrenic subjects was as good as that of the normal subjects. A signal detection analysis indicated further that both $d'$ and beta were comparable between groups, suggesting that both storage and decision to respond are comparable between schizophrenic patients and normal control subjects. The authors therefore concluded that the difficulty for schizophrenic patients on recall tasks must result from retrieval inefficiencies, which may result from deficient encoding processes during memorization.

Utilizing a sorting procedure, Koh, Kayton and Schwartz (1974) further examined structural properties of memory in 17 nonpsychotic schizophrenic patients compared to 12 psychiatric controls patients (character disorders) and 16 normal subjects. In experiment one, subjects were presented with 40 words typed on index cards and told to sort them into piles, placing words they thought went together in the same pile. Twenty of the stimulus words consisted
of 20 unrelated nouns and the remaining 20 consisted of words that belonged to one of five conceptual categories. Experiment two consisted of having these same subjects perform this task under a time constrained condition, followed by having subjects rate each word along a pleasantness-unpleasantness dimension. The hierarchical clustering schemes of each group were compared under each condition. Schizophrenic subjects showed the same overall clustering scheme as both control groups in the first experiment, which were based upon the semantic and associational aspects of the words, suggesting that their storage structure for English words is intact. However, schizophrenic patients manifested more idiosyncratic clustering during the time constraint condition, sorting words based upon their affective characteristics rather than semantic or associational features. It therefore appears that time pressure disrupts the normal sorting of words based upon common semantic aspects of the stimuli, producing a sorting strategy based upon their affective components. Thus, although schizophrenic patients did not differ from normal or psychiatric control subjects with regard to semantic organization processes in a non-demand condition, the demand condition (time limit) resulted in a disruption of the normally operative processes.

As was the case in the literature concerned with memory processes in the affective disorders, the depth of processing paradigm (Craik and Tulving, 1975) has been employed in like manner with schizophrenic patients. Koh and Peterson (1978) compared schizophrenic patients to normal and psychiatric (depressed and/or
character disorders) control subjects on a four level depth of processing task. Following the rating tasks, subjects were unexpectedly told to recall as many words as possible. Following the recall task, subjects were given a recognition test for the same material. The performance of normal control subjects was superior to both patient groups who did not differ from each other. However, the difference between normal and patient groups was found to be due to inferior recall by the patient groups on the yes rhyming words only. No difference between groups was found on the recognition task. All groups remembered more yes than no rated words, and showed an increase in recall for more deeply processed words. The authors concluded that the levels of processing paradigm produces results with schizophrenic subjects comparable to those of normal patients. Further, as found in previous studies, schizophrenic patients were not characterized by a recognition deficit.

It therefore appears that schizophrenic subjects may be characterized by a recall but not recognition deficit which may be due to encoding inefficiencies resulting in retrieval difficulties. Further, this deficit may be due to inefficient use of organizational properties of the to-be-remembered stimuli. Having established the presence of a recall deficit, investigators have sought to determine if the schizophrenic encoding deficit might be ameliorated.

Larsen and Fromholt (1976) compared 17 schizophrenic patients to 13 normal controls for recall of 25 unrelated words following
sorting to criterion, with the sorting criteria being two consecutive identical sorts of the words. Although schizophrenic subjects required more trials to reach this criterion, once reached schizophrenic patients recalled as many words as normal control subjects. Thus, providing sufficient time for organizational stability to be obtained resulted in an amelioration of this deficit.

Koh, Kayton and Peterson (1976) were also able to alleviate the recall memory deficit of schizophrenic patients using an incidental free recall in which affective-semantic encoding was induced by the experimenter. Eighteen schizophrenic patients, 15 psychiatric control patients (including 3 bipolar and 3 unipolar depressed patients) and 19 normal controls participated in two recall conditions, intentional and incidental. In the incidental condition, subjects rated 50 pleasant, unpleasant and neutral words along an affective dimension on two occasions, followed by unexpected recall and recognition. In the intentional condition, subjects were aware that their recall for words would be tested following a single rating of an additional 50 words drawn from the same categories as list one along the same affective dimension. This second task was repeated three times. No differences between groups were found in the incidental condition, with all groups remembering about the same amount of pleasant, unpleasant and neutral words. However, normal and psychiatric controls tended to remember more pleasant than unpleasant words while schizophrenic subjects did not manifest this "Pollyana effect". No differences
between groups were found on the recognition task. On the intentional task, no differences were noted between groups either overall or with regard to affective type. The authors concluded that the schizophrenic recall deficit may be modified by inducing proper encoding, such as that provided by having subjects rate the words for their affective dimension. Thus it appears that inducing affective encoding is sufficient to alleviate the recall deficit in schizophrenic patients.

It is interesting to note the differential recall of pleasant versus unpleasant words in normals and psychiatric controls but not in schizophrenic patients. Koh, Grinker, Marusarz and Foreman (1981) followed up these findings by examining the role of schizophrenic anhedonia in the recall of affective words. Sixteen schizophrenic, 16 psychiatric control patients and 16 normal subjects were tested for recall and recognition of pleasant, unpleasant and neutral words on both multi-trial free recall and sorting tasks. Normal control subjects remembered more words than schizophrenic patients for the free recall but not recognition tasks. Schizophrenic patients remembered less pleasant words than normal and psychiatric subjects on the multi-trial free recall task. Following the sorting task, normal and psychiatric control subjects remembered more pleasant than unpleasant words, while schizophrenic subjects did not manifest this differential recall. These results suggest that schizophrenic subjects manifest a deficit of recall for pleasant words.
Kay (1982) has further examined the role of affect in the recall of schizophrenic patients using a release from proactive inhibition paradigm (Wickens, 1972). Proactive inhibition results from the repeated exposure to words from the same category, leading to a decrement in memory performance. However, when items with different characteristics are introduced, memory tends to return to normal levels of recall. Twenty-one paranoid schizophrenics and 21 nonparanoid schizophrenics and 21 psychotic nonschizophrenic patients participated. Subjects attempted to recall words in three conceptual categories, conceptual, affective and physical. Within each category, subjects were given three trials where words within each trial were from the same category, followed by a fourth trial of words from a different category. For example, affective trials consisted of three trial of four words each of pleasant words, followed by a trial of unpleasant words. The measure of interest was the examination of number of words recalled across trials. Although control subjects remembered more words overall than schizophrenic patients, schizophrenic patients showed more release than controls for affective words, while controls showed more release on the conceptual trials. With regard to schizophrenia subtypes, paranoid patients showed more release on physical trials while nonparanoids showed most release on conceptual trials with no difference between groups on the affective trials. As release from proactive inhibition is taken to be an index of verbal encoding, these results suggest that the affective or emotional connotations of words are prepotent for schizophrenic patients, distinct from
the conceptual prepotency demonstrated by the other psychiatric control group. Taken together, these results suggest that the affective content of words plays an important role in their recall, a role different for that of schizophrenic patients compared to both psychiatric and normal control subjects. We have seen similar results in our review of the literature examining memory in depressed patients.

One final study is important for the purposes of the present investigation. Calev, Venables and Monk (1983) examined recall and recognition of severe and mild schizophrenic patients. In addition to comparing schizophrenic patients at different levels of functioning, these authors also introduced an important procedural modification. Following Chapman and Chapman (1973), Calev and Monk (1982) noted that the differences in recall versus recognition memory noted for schizophrenic patients may be due to methodological artifacts resulting from the two procedures differing with regard to discriminability. Therefore, Calev et al. (1983) sought to rectify this by equating recall and recognition tasks for discriminability. Further, these authors felt that the results reported by Larsen and Fromholt (1976) and Koh et al. (1976) regarding amelioration of the schizophrenic recall deficit were due to their inclusion of relatively mildly disturbed patients. It was hypothesized that the deficits of more severely disturbed patients may not be so readily amenable to change.

In their first experiment, 15 chronic (severe) schizophrenic patients were compared to normal control patients for increases in
recall memory using Larsen and Fromholt's (1976) sort-to-consistency method. Results supported the severity hypothesis, with the schizophrenic sample still remembering less words than normals even after having reached sorting consistency. Schizophrenic patients also forgot more words at a second testing 24 hours later. Experiment 2 involved the comparison of severe schizophrenic and mild schizophrenic patients to normal control subjects on the sorting task using common English words which belonged to one of several hierarchical categories. As the first experiment included words which did not belong to categories, this second task was thought to be less demanding than the first. Mild schizophrenic patients were found not to differ from normal controls, although severe schizophrenic patients recalled less than the normal controls. The third experiment involved the utilization of recall and recognition tasks which were matched for discriminability. Twelve severely disturbed schizophrenic patients were compared to normal control subjects, with subjects freely recalling as many words as possible, followed by a recognition task for the sorted words. Schizophrenic patients were found to perform more poorly than normal controls on both recall and recognition. These three experiments reported by Calev et al. (1983) suggest that severely disturbed schizophrenic patients have a memory pathology different from that of mildly disturbed schizophrenics. Further, the lack of matching for discriminability of recall and recognition tasks in earlier studies may have produced the results reported by earlier investigators which noted a recall but not
This review of a select portion of the literature concerned with cognitive processes in schizophrenia is indicative that schizophrenic patients manifest a recall deficit when compared to normal control subjects. Those studies which have included psychiatric control groups have been somewhat inconsistent with regard to the relationship between schizophrenic and psychiatric patients. Whereas some have reported differences between these groups (Nachmani & Cohen, 1969; Koh et al., 1981; Kay, 1982), other have failed to note such a difference (Johnson et al., 1977; Koh et al., 1973; Koh and Peterson, 1978). These investigations have further pointed to the importance of affective components of the to-be-remembered stimuli with regard to encoding prepotency (Koh, Kayton and Peterson, 1976; Koh, Kayton and Schwartz, 1976; Kay 1982), and differential recall of pleasant versus unpleasant words (Koh, Kayton and Peterson, 1976; Koh et al. 1981). Finally, we have seen how the dimensions of severity of psychopathology and lack of match for discriminability between tasks may account for some of the effects noted (Calev et al., 1983).

Conclusions

The preceeding review of memory processes in the affective disorders focused mainly upon two main topics with regard to cognition in depression; methodological issues and memory processes. Summarizing the conclusions of the methodological
review, six major problems in this literature were identified: 1) proximity of ECT to time of testing; 2) failure to use standardized diagnostic instruments; 3) lack of psychiatric control groups; 4) use of analogue subjects; 5) failure to control for medication; and 6) failure to separate bipolar and unipolar subjects into discreet groupings. Specific recommendations were also offered to correct these deficits.

By failing to adequately control these variables, investigators have in large part produced a literature which is at best inconclusive and at worst incomprehensible. Obviously not all studies in this area suffer from these problems; yet enough inadequate studies have found their way into the literature to greatly muddy the waters, and make conclusions based upon their results untenable. Yet when one examines later studies based upon such research, rarely is mention made of the methodological difficulties present. Rather, conclusions made in the methodologically flawed projects are offered to the reader as conclusive by subsequent authors and reviewers, further clouding the picture regarding cognition in depression. It is the authors' opinion that until investigators produce methodologically sound research, investigations into cognitive processes in the affective disorders will only produce chaff which will be difficult to later separate from the grain.

The above-mentioned considerations make the second purpose of this treatise, conclusions to be drawn based upon the literature, rather difficult. However, a model will be presented based upon
the available research which will also include identification of confounding factors. Reference to the model in Figure 1 should aid in following this presentation. Although the model will be discussed in terms of the disorders of main concern (i.e. affective), hypotheses regarding like processes in schizophrenic patients will be offered following this presentation.

A Model of Cognitive Processes in the Affective Disorders

Investigations into cognitive processes in the affective disorders have in the main attempted to identify either content specificity or structural deficits associated with depression. Global memory impairments in depression have been noted when compared to normal controls (Breslow et al., 1980; Stromgren, 1977). However, this specificity has been shown not to exist when depressed and manic patients have been compared to pathological controls (Davis & Unruh, 1980; Otteson & Holzman, 1976; Oltmanns, 1978; Koh et al., 1973; Koh & Peterson, 1978). Additionally, following recovery these deficits have been noted to disappear (Sternberg & Jarvik, 1976; Glass et al., 1981). The absence of an affective disorder-specific deficit in memory suggests that the disruption of memory processes in depression and mania is due to a general or global pathology factor.

We have also noted a direct relationship between severity of illness and cognitive deficits, such that the more severe the illness the greater the deficit (Cronholm & Otteson, 1961;
Figure 1.

Model of the effects of mood-state and degree of pathology on memory.
Stromgren, 1977; Henry et al., 1971; Otteson & Holtzman, 1976; Henry et al., 1973). Miller (1975), in a comprehensive review of the literature concerned with psychological deficit in depression, noted that the only difference between subtypes of depression that emerged was related to severity—the more severe the depressive symptomatology, the more deficient on a variety of psychological measurements. Further, Lang and Buss (1965) in their review of the schizophrenia literature have also noted the importance of the severity dimension, stating that "There is ample evidence that severity of psychopathology and psychological deficit are positively related. Some theorists hold that this is the only meaningful relationship between deficit and diagnosis..." (p. 100).

Severity has also been linked to sustained effort or motivation, such that the more severe the level of pathology the less motivation or sustained effort present (Cohen et al., 1981). As has been pointed out previously, effort is quite important with regard to the encoding and storage of information: severity of pathology may produce deficits by reducing ability to sustain effort. Secondly, the demonstration of similar deficits for depressed, manic and schizophrenic subjects suggests that global pathology levels result in disorganization of memory structures. Thus, the thought disorder characteristic of psychopathology may result in inefficient information processing regardless of diagnostic category. Therefore, patients with a variety of diagnostic categories may share similar deficits providing similar levels of pathology are present (Neale & Oltmanns, 1980). These
nondiagnostic-specific deficits noted in the affective disorders may occur in one of two ways. First, severity of illness may produce low levels of effort, thus retarding encoding and storage of information, resulting in recall deficits. Second, global pathology may disrupt trace storage and recall via its disorganizational nature. In effect, psychopathology may weaken associational patterns, resulting in recall deficits. It is also possible that intrusive/illogical thoughts resulting from pathology, "crowd" short-term memory thus interfering with processing (Miller, 1975). In conclusion, this model posits two routes by which global psychopathology may disrupt memory processes, level of pathology and level of effort. Our bias is that level of pathology is the major determinant in that it affects effort which in turn decreases recall.

We have also seen evidence for the presence of congruence between mood and to-be-remembered words (Davis, 1979a; 1979b; Kuiper & Derry, 1982). Depressed patients have demonstrated better recall for depressed than nondepressed content words, while the opposite held true for nondepressed subjects. These results have been regarded as demonstrating that depressed patients are characterized by an activated negative self-schema. However, recall has been shown to be directly related to mood level (Lloyd & Lishman, 1975; Clark & Teasdale, 1982) and this congruence between mood-state and affective content of recalled material has also been noted in bipolar manic patients (Weingartner et al., 1977). The demonstration of congruence between mood and content of target
words in non-clinical populations (i.e., college students—Davis, 1979b; Kuiper & Derry, 1982) also suggests that mood, not clinical depression, exerts the most profound influence on content of material recalled, cutting across diagnostic categories. Thus, congruence between affective state and memory traces increases the likelihood of recall.

Taken together, these studies suggest that mood-state is important in determining content of remembered memory traces. Therefore, mood, not diagnosis, may be considered to act as a switching device, responsible for activation or deactivation of schemata. Mood-state provides contextual cues for memory, influencing which memories will be accessed and recalled; playing a "switching" or "gatekeeper" function in that the presence of depressive mood increases the probability of remembering negative words or events. This relationship appears to be degree-related such that the more depressed one's mood the quicker and more extensive the recall of negative memories.

As was found for structural memory deficits, the negative self-schema as defined in these studies may not be specific to the affective disorders. Extending this line of reasoning we may hypothesize a relationship between mood-state and content of the following kind. Sad mood, which may arise from negative life experiences, may activate the depressive self-schema. Once activated, the depressive self-schema selects negatively toned material from both LTM and the environment to be processed in STM. The self-schema may be seen to result in differential recall of
material congruent with mood-state.

We can see that mood functions as a switching mechanism in two related manners. First, mood serves as a contextual cue, preferentially activating associations in memory which are congruent with mood-state. Thus mood-state results in recall of association with hedonic mood congruent with mood-state. Once activated the self-schema selectively encodes and retrieves information congruent with the affective state. Illustrative of this function is the evidence suggesting that normals and non-depressed psychiatric patients with depressed mood show recall patterns similar in content to clinical depressives. Thus mood functions in a manner analogous to a trainyard switchman, determining which path the "train of thought" will travel.

Therefore, memory content is hypothesized to be determined by two dimensions, mood and severity. Both produce their effect by altering structural processes; mood by determining context and schema activation, severity through lack of effort and by producing disorganization. In addition, we can further hypothesize a relationship between memory content in consciousness and mood, such that a positive feedback loop is created (Beck, 1967). That is, mood increases the likelihood that thoughts present in consciousness will be congruent with hedonic (mood) state, which in turn will affect mood-state such that these thoughts will intensify the mood.

If this conceptualization of the relationship between mood and memory is accurate, then one would expect various diagnostic groups
who are characterized by similar mood to demonstrate similar recall patterns with regard to memory for past events, content-specificity in word recall, and recall latency for affective materials. Thus, schizophrenic and depressed patients with similar levels of depressed mood and levels of pathology may be indistinguishable along these memory dimensions. Similarly, if groups are equated for severity of pathology, disorganization and memory deficit patterns should be similar across diagnostic categories.

The final construct contained within this model is that of response style. As demonstrated by Larner (1977) and Miller and Lewis (1977), depressed patients appear to adopt a conservative response style. Thus regardless of the actual content of memory, depressed patients may actively choose not to report this content to the investigator. Therefore, memory deficits (i.e., structural) which appear to characterize depression may in fact result from active inhibition of responding.

This model provides a conceptualization of the relationship between constructs identified and investigated in reports concerned with memory in the affective disorders. Specifically, two critical dimensions have been focused upon which have received little direct, explicit investigation, mood-state and severity of pathology. Although the model argues for consideration of these constructs as discreet entities, the present status of this literature does not provide a firm basis for such a division. However, the model does present relationships between variables which are testable and falsifiable, thus allowing for experimental
In conclusion, the literature concerned with cognitive processes in the affective disorders is far from complete. Many studies have been shown to suffer from serious methodological flaws. Additionally, attempts to identify content or deficits specific to affective versus other pathological disorders have failed. The present investigation sought to address both the methodological problems and hypotheses generated by this model. Following is a compendium of the hypotheses tested in this investigation.

HYPOTHESES

The following hypotheses derived from the model described above were tested in the present investigation.

1) Severity of pathology is predicted to be a crucial factor in the organization and recall of to-be-remembered stimuli. More severely disordered subjects are hypothesized to manifest poorer recall on all tasks than subjects who are functioning at higher levels. Further, severely disturbed subjects are predicted to show more disorganized organizational properties as measured by intertrial repetition and hierarchical clustering analyses. Insufficient evidence exists regarding differential performance on categorized versus uncategorized lists for groups split along the severity dimension. However, if differences do exist, we expect that they will be most visible on the uncategorized lists.
1a) Given that the manic and schizophrenic samples contain thought disordered subjects while the depressed group does not, manic patients are hypothesized to be more similar to schizophrenic patients than to depressed patients with regard to overall recall and disorganization.

2) Mood-state is predicted to be a crucial factor with regard to the content of the recalled materials. That is, congruence between mood-state and affective dimensions of the to-be-remembered stimuli is expected to enhance the recall of the mood-congruent material. That is, subjects reporting depressed mood, regardless of diagnostic category, are expected to remember more depressed content words than subjects reporting low levels of depressed mood. Therefore, patients from different diagnostic categories reporting similar mood-states should share more recalled words in common than patients from the same diagnostic category who report different mood-states.

When groups are considered as homogenous samples rather than divided by mood or severity, the following relationships are expected to emerge.

3) Depressed subjects are expected to recall more depressed self-referent words, and to recall more depressed than happy words following free recall and sorting tasks (Beck, 1967; Lloyd & Lishman, 1975; Derry & Kuiper, 1981; Kuiper & Derry, 1982; Clark & Teasdale, 1982).
4) Manic patients are expected to recall more neutral than depressed self-referent words, and to recall more happy than depressed words following free recall and sorting tasks.

5) Schizophrenic patients are expected to recall equivalent numbers of depressed, neutral and happy words (Koh et al., 1976; 1981).

6) Control subjects are expected to recall more neutral than depressed self-referent words, and to recall less depressed than happy or neutral words on sorting and free recall tasks (Koh et al., 1976; 1981).

7) The subjective organization of schizophrenic and manic patients is predicted to be more idiosyncratic and disorganized than depressed or control subjects on the uncategorized trials of both sorting and free recall tasks (Henry et al., 1971). Patient groups are expected to be equivalent on the uncategorized trials (Koh et al., 1973). However, qualifying this prediction is the fact that many previous investigations have included only nonpsychotic subjects in their samples. As thought disordered patients were included in the manic and schizophrenic samples, this prediction may not hold in the uncategorized condition.

8) Control and depressed subjects are expected to recall more words overall in the sorting and free recall conditions than manic or schizophrenic patients. If the depth of processing paradigm is in fact successful in inducing sufficient processing in manic and schizophrenic groups, it is expected that there may be no difference between groups on recall for this measure (Henry et al.,
9) Although results present in the schizophrenia literature suggest that response bias is not a factor in recall (Koh et al., 1973), results of the depression literature suggest otherwise (Whitehead, 1973; Larner, 1977; Miller & Lewis, 1977). As studies investigating memory in schizophrenia have often included affective disorder patients as controls, these results are somewhat conflicting. Therefore, it is unknown whether response bias will be found to differ between groups in this investigation.

The following predictions were made regarding the severity, symptom and mood-state measures.

10) Depressed subjects were expected to score as more depressed on the interview schedules than all other groups, with schizophrenic patients occupying an intermediate position between normal control subjects and depressed patients. Manic patients were expected not to differ from normal controls on this measure.
11) Manic patients were expected to score as more manic on the interview schedules than all other groups, with schizophrenic patients occupying an intermediate position between control and manic patients. Depressed subjects were expected to score similar to control subjects on these measures.
12) Both groups of schizophrenic patients were expected to score higher than all other groups on the schizophrenia interview schedules, with manic patients occupying an intermediate position.
between control and schizophrenic patients. Depressed subjects were expected to be similar to control subjects.

13) On the mood measures, depressed subjects were expected to indicate more depressed mood than all other groups, with schizophrenic groups expected to manifest more depressed mood than either manic or control groups.
METHOD

Subjects

Twenty paranoid schizophrenic, 20 nonparanoid schizophrenic, 20 bipolar manic, and 20 unipolar depressed psychiatric inpatients and 10 nonpsychiatric normal controls participated in a study examining the relationship between mood state, level of psychopathology, and organization of verbal material in memory. Participation was voluntary; no monetary inducement was offered.

Diagnostic Criteria

Given the previously noted methodological shortcomings pertaining to subject selection issues, the present investigation sought to address and control these potential confounds in the following manner. Psychiatric patients were initially identified by screening university hospital psychiatric records of currently hospitalized patients. A diagnosis made by the patient's attending psychiatrist of schizophrenia, major affective disorder unipolar depressed type, or major affective disorder bipolar manic type based upon the criteria of the Diagnostic and Statistical Manual of the American Psychiatric Association, third edition (DSM-III; APA, 1980) was required for consideration for inclusion in the study.
Of those subjects meeting this criteria, only subjects between 18 and 45 years of age, with a minimum 10th grade education, negative history for alcohol or drug abuse, no evidence of organic impairment, no history of electroconvulsive therapy within the last two years, who had been on their current medication for at least one week, and whose lifetime number of days in a psychiatric hospital was under two years were contacted and invited to participate in the study. Following an explanation of the purpose and procedure of the investigation, written informed consent was obtained from each patient. Subjects were then interviewed and independently diagnosed by the author using the Research Diagnostic Criteria (RDC; Spitzer, Endicott, & Robbins, 1978): subjects who received the same diagnosis using both the DSM-III and RDC criteria were then included in the psychiatric samples. Schizophrenic subjects were further divided into paranoid and nonparanoid groups based upon the Research Diagnostic Criteria. Nonpsychiatric normal controls were required to be currently be free of psychiatric disturbance or physical disability and to have completed at least 10 years of formal education: normal control subjects were interviewed using the RDC to determine the presence or absence of psychiatric disorders. Additionally, these subjects were required to have a negative personal and immediate family history for psychiatric disturbance.
Pathology and Mood Assessment Scales

All subjects were assessed for severity of psychopathology, level of current functioning, and mood-state using the following measures.

1) Schedule for Affective Disorders and Schizophrenia-change version (SADS-C; Endicott & Spitzer, 1978). A subset of the full SADS items, this structured clinical interview provides a rating of the severity of depressive, manic, and schizophrenic symptoms for the week immediately prior to the interview, with high scores indicative of more severe levels of pathology. Three symptom subscales were derived from the SADS-C.

   a) Schizophrenia subscale (SADSCHIZ). Comprised of all items measuring severity of schizophrenic symptomatology, including distrustfulness, presence and severity of delusions, presence and severity of hallucinations, impaired understandability due to psychopathology, inappropriate and blunted affect, and bizarre behavior.

   b) Depression subscale (SADSDEP). Comprised of all items measuring severity of depressive symptomatology, including depressive mood, worrying, self-reproach, negative self-evaluation, discouragement, suicidal tendency, somatic and psychic anxiety, initial, middle, and terminal insomnia, lack of energy, weight and appetite loss, hypochondriasis, loss of interest, diurnal mood variation, agitation, and retardation.

   c) Mania subscale (SADSMAN). Comprised of all items measuring severity of manic symptomatology, including euphoric mood,
grandiosity, sleep decrease due to mania, increased energy, and increased activity.

2) Global Assessment Scale (GAS; Endicott, Spitzer, Fleiss et al., 1976). Provides a measure of the individual's lowest level of functioning for the week prior to the interview, with high scores indicative of higher levels of functioning. In order to ascertain level of current functioning, instructions were modified to include the individual's level of functioning for the 24 hour period immediately prior to the interview.

As a means of avoiding monomeasurement bias (Cook & Campbell, 1979) and of assessing the concurrent validity of the SADS-C, subjects were also rated with the following symptom measures.

3) Hamilton Rating Scale for Depression (HAM; Hamilton, 1960). Includes 17 items rated for severity of depressive symptoms for the week immediately prior to the interview, with higher scores indicating more severe levels of depressive symptomatology. Dimensions covered by this scale include depressed mood, suicidal ideation, somatic and psychic anxiety, initial, middle, and terminal insomnia, weight loss, decreased libido, decreased ability to experience pleasure, decreased energy, agitation, retardation and hypochondriasis.

4) Bech-Rafaelsen Mania Scale (BRMS; Bech, Bolwig, Dein, Jacobson, & Gram, 1975). Includes 11 items rated for severity of manic symptomatology for the week immediately prior to the interview,
including increased motor activity, increased verbal activity, flight of thoughts, voice level, hostility/destructiveness, manic mood, self-esteem, contact (meddling), sleep, sexual activity, and quality/quantity of work.

5) New Haven Schizophrenia Index (NHSI; Astrachan et al., 1972). Fourteen item adaptation of the NHSI excluding catatonic items which yields an overall composite score for severity of schizophrenia. Item domain includes delusions, bizarre thinking, auditory, visual or other types of hallucinations, autism, looseness of association, blocking, concreteness, derealization, depersonalization, inappropriate affect, confusion, and paranoid ideation.

6) Maine Paranoid-Schizophrenia Rating Scale (Vojtisek, 1975). A 10-item scale developed to differentiate paranoid from nonparanoid schizophrenic patients. Five items are scored for presence and severity of paranoid symptomatology (MAINE-PS) and five are scored for presence and severity of nonparanoid schizophrenic symptomatology (MAINE-NPS).

Current mood-state was measured using the following self-report measures.

7) Profile of Mood States (POMS; McNair, Lorr and Droppleman, 1971). Scale consisting of 65 self-rated adjectives rated for their descriptive relevance to the subject's current mood states,
including a mood score for depressed mood (POMSDEF).

8) Clyde Mood Scale (CMS). Scale consisting of 48 self-rated adjectives yielding measures of the subject's current mood-state, including a score for depressed mood (CLYDEDEP).

**Dependent Measures**

Each subject completed the following tasks.

1) Continuous Recognition Procedure (Kimura, 1963). Based upon signal detection theory, (Lachman, Lachman & Butterfield, 1979), this task is an adaptation of Brooks (1974) procedure which involved the sequential presentation of 160 cards, each having a letter or letters of the alphabet typed upon it. Subjects were required to read each letter of combination of letter aloud in order to assure the experimenter that subjects had no difficulty viewing the cards. Eight of the letter combinations were repeated a total of seven times each during the task, for a total of 56 card repetitions. Subjects were instructed to indicate whether the card currently being viewed had previously been presented. Total viewing time per card was three seconds.

2) Multi-Trial Free Recall (Koh, Kayton & Berry, 1973). Two 16 word lists, each word of which was typed upon a 3 x 5 inch card, were presented a total of five times each with a 90 second recall period following each presentation (see Appendix A). Words for the unrelated condition were taken from those used by Koh et al. (1973)
which were selected from the Paivio, Yuile and Madigan (1968) norms, each having high values for imagery, concreteness, and meaningfulness. Words for the related condition were drawn from four conceptual categories: happy adjectives, depressed adjectives, color adjectives, and taste adjectives. Order of card presentation across trials was randomized across trials for each subject, with each subject receiving the same randomized order. Subjects were required to read each word aloud for each presentation, with viewing time for each card being five seconds. Following each trial, subjects were required to start with a three-digit number and count backwards by a fixed unit for 30 seconds in order to clear the short-term memory store. Following the counting task, subjects were told to recall as many words as they could in any order. In each case the unrelated (uncategorized) list trials were presented prior to the categorized trials. A ten-minute interval which served as a break for the subject and a chance for further clearing of the short-term store was interposed between the List 1 block of trials and the List 2 block of trials.

3) Sorting (Mandler & Pearlstone, 1966). Two lists of 16 words each, one consisting of unrelated words and the other consisting of words grouped in the same categories as used in the categorized multi-trial free recall condition were used (see Appendix B); words in the uncategorized condition were drawn from the same source as noted. or the multi-trial free recall condition. Each word was typed upon a 3 x 5 inch card. Subjects were given each deck one at
a time and were told to sort the words into piles, placing the cards they felt were related to each other for whatever reason in the same pile. They were further instructed that they could use as many piles as they wished, placing as many cards as desired in each pile. Order of presentation within each deck of cards was consistent across subjects. Each list was sorted once, followed by 30 seconds of small talk initiated by the examiner to clear the short-term memory store. Subjects were then unexpectedly requested to recall as many words as possible in any order. A 10 minute break was provided between the two sorting tasks. Following this task, subjects were requested to read each word aloud and to provide a brief definition of each in order to assure the experimenter that subjects understood the meaning of each word.

4) Depth of Processing (Craik & Lockhart, 1972). Following Derry and Kuiper's (1982) procedure, subjects were sequentially presented with 18 depressed and 18 nondepressed content words and asked to make one of three judgements for each word: a) structural (is the word typed in capital letters?); b) semantic (does the word mean the same as "word"?); or c) self-referent (does the word describe you?) (see Appendix C). Structural and semantic ratings were counterbalanced for yes and no answers. All subjects viewed the cards in the same order for five seconds each, with the first three and last three items of the list serving as buffer items to control for primacy and recency effects (Crowder, 1976). Immediately following presentation of all 42 words, (36 depressed and
nondepressed words and 6 buffer items) subjects were unexpectedly asked to recall as many words as possible in a three minute period.

In order to account for differences between groups which might be due to inattention, observational measures of attention were taken every five seconds while subjects were performing each task. Subjects were considered to be attending if their vision was fixed upon the stimulus card during the presentation portion of the trial, and if they repeated each word as required by the protocol.

Procedure

Day 1

Subjects were rediagnosed by the author using the Research Diagnostic Criteria.

Day 2

Patients were interviewed and rated for symptom severity and level of functioning for the week prior to the interview using the SADS-C, HAM, BRMS, NHSI, Maine scales, and GAS. Following these ratings, subjects were tested on the signal detection task.

Day 3

Within 24 hours of the severity rating, subjects were tested on the multi-trial free recall, sorting and depth of processing tasks. All subjects received the multi-trial free recall task first, followed by the depth of processing task, followed by the sorting task. Following completion of the testing procedure, all subjects completed the mood rating scales, the POMS and CMS. Subjects were then debriefed and given an opportunity to ask questions.
RESULTS

All groups were found not to differ with regard to age, sex, race or education (all ANOVA and chi square p's >.10). Psychopathology groups, excluding normal controls, were found not to differ with regard to total length of hospitalization or length of current hospitalization (all p's >.10). Psychopathology and normal control groups were then compared on the symptom severity and mood-state measures. Duncan's multiple range test for significance was used for all post hoc main effects comparisons described in this study, while significant interactions were examined by computing Least Significant Difference values (LSD).

Severity and Mood Measures. The relationship between the symptom, functional impairment, and mood measures was examined by computing Pearson product-moment correlations for each measure with every other measure. Table 1 presents the correlations between these measures across all subjects, while Tables 2 to 5 include these correlations within each patient group. As can be seen in Table 1, the GAS was negatively correlated with all symptom and mood measures, indicating that as severity of symptoms increased level of functioning decreased. Further, high positive correlations were
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### TABLE 3

**CORRELATION OF MOOD AND SEVERITY MEASURES IN MANIC SAMPLE**

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found between symptom severity measures measuring the same symptom domain, while severity measures of different symptom domains were negatively correlated with each other. For example, the HAM was highly correlated with the SADSDEP (.97) but negatively correlated with the other symptom measures; NHSI (-.07), SADSCHIZ (-.07), BRMS (-.30) and SADSMAN (-.34). Thus, the symptom measures employed appear to be measuring different symptom domains.

Within patient groups, however, differences between symptom measures was not so pronounced, suggesting that within groups these symptom dimensions are not as independent as indicated by Table 2. Although measures of the same symptom domain within each patient group correlated higher with each other than with other measures, positive correlations were noted between symptom measures of different symptom domains. For example, although the HAM was highly correlated with the SADSDEP (.96) in the depressed patient sample, it was also positively correlated with the NHSI (.31) and SADSCHIZ (.18).

Groups were found to differ on all of the symptom rating scales: the HAM $[F(4,85)=26.94, p<.0001]$; the SADSDEP $[F(4,85)=23.91, p<.0001]$; the BRMS $[F(4,85)=30.95, p<.0001]$; the SADSMAN $[F(4,85)=45.64, p<.0001]$; the NHSI $[F(4,85)=21.77, p<.0001]$; the SADSCHIZ $[F(4,85)=17.32, p<.0001]$; the Maine Paranoid Scale $[F(4,85)=23.42, p<.0001]$; and the Maine Nonparanoid Scale $[F(4,85)=9.26, p<.0001]$. Mean scores for each group on each severity and mood measure are presented in Table 6. Depressed patients were characterized by more depressive symptomatology than
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both schizophrenic groups who in turn were characterized by more depressive symptomatology than manic patients. Control subjects were rated lower than all psychopathology groups for depressive symptomatology. On the mania rating scales, manic patients were characterized by more manic symptoms than all other groups who did not differ from each other. Both schizophrenic groups were characterized by higher levels of schizophrenic symptomatology on the NHSI and SADSCHIZ than manic, depressed and control subjects who did not differ from each other. Nonparanoid schizophrenics were rated as more symptomatic on the Maine Nonparanoid Scale than all other groups, while paranoid schizophrenics were more symptomatic than normal subjects on this measure. Finally, paranoid schizophrenics were rated as more symptomatic than all groups on the Maine Paranoid Scale, while nonparanoid schizophrenic patients were more symptomatic than depressed or normal subjects.

Significant differences between groups were also found for both self-report measures of depressed mood, the Profile of Mood States depression factor (POMSDEP) F(4,85)=8.93, p<.0001, and the Clyde Mood Scale depression factor (CLYDEDEP) F(4,85)=7.94, p<.0001. Group means are presented in Table 6. For both measures, depressed patients characterized themselves as currently experiencing higher levels of depressed mood than nonparanoid schizophrenic, manic and normal control subjects, with paranoid schizophrenics not differing from any psychopathology group. Further, paranoid schizophrenic, nonparanoid schizophrenic and manic patients all characterized themselves as currently
experiencing higher levels of depressed mood than normal control subjects.

Finally, group differences were also noted on the level of functioning measure, the GAS \([F(4,85)=40.43, p<.0001]\). Control subjects were rated as functioning at a higher level than all patient groups, with manic patients rated as functioning at a higher level than both schizophrenic groups. Depressed subjects did not differ from any psychopathology group with regard to level of functioning. Thus, the only difference between psychopathology groups that reached significance was that manic patients were rated as being less functionally impaired than the schizophrenic patient groups.

**Signal Detection and Attention Measures.** Groups were found not to differ on the signal detection task \((p's >.10)\) with regard to either the measure of pure memory \((d')\) or response bias \((\beta)\). Further, groups were found not to differ on the attentional measure: that is, all groups were found to be attending to the stimuli at each rating. These results suggest that any differences that may emerge between groups on the remaining tasks were not due to differences in either response bias or attention to the experimental tasks.

The relationship between the functional impairment, severity of pathology and signal detection analysis was examined by computing the amount of variance in the signal detection task accounted for by each severity measure. As may be seen in Table 7, with the
exception of functional impairment in the paranoid schizophrenic sample, little variance was accounted for by either symptom severity or functional impairment level. Finally, analyses of covariance (ANCOVA) with GAS as covariate were performed. Normal control subjects were excluded from these and all subsequent ANCOVAs as a criterion for group membership in this group was the absence of psychological impairment. No difference between ANOVA and ANCOVA results was noted for the signal detection analysis. Coupled with the low amounts of variance accounted for by the symptom and functional impairment measures, these results indicate that severity of pathology does not influence patient responses on this task.

Subjective Organization in Multi-Trial Free Recall

Multi-Trial Free Recall. A 3-way analysis of variance with one factor between (Groups) and two factors within (Trials, and Type—categorized vs. uncategorized) was performed for the multi-trial free recall subjective organization data. All main effects were significant: Group [F(4,84)=135.59, p<.0001]; Trials [F(4,78)=201.06, p<.0001] and Type [F(1,84)=4.41, p<.05]. Examination of the Trials main effect indicated that recall for categorized and uncategorized words increased across all trials, with the exception that trials 3 and 4 did not
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significantly differ. However, the Group x Type interaction was significant \[F(4,84)=9.33, p<.0001\], indicating that control subjects remembered more words of both types than all psychopathology groups except depressed patients whose recall did not differ from that of control subjects for the categorized list. Further, only the depressed patients remembered more categorized than uncategorized words. Finally, both paranoid schizophrenic and depressed patients recalled more categorized words than nonparanoid schizophrenic patients. No differences between patient groups were noted for the uncategorized condition.

The amounts of variance in multi-trial free recall accounted for by each severity measure were computed and are presented in Tables 7 and 8. With few exceptions, multi-trial free recall scores bore little relation to these dimensions in the paranoid schizophrenic, depressed, and manic samples. Within the nonparanoid schizophrenic sample, however, the severity measures were moderately to highly related to recall, indicating that symptom severity and functional impairment do affect the nonparanoid schizophrenics' recall on this task.

ANCOVAs with GAS as covariate were then compared to one-way ANOVAs for every level of this task in order to further examine the relationship between functional impairment level and multi-trial free recall. For those ANOVAs where depressed and manic patients looked similar to each other and different from nonparanoid schizophrenic patients, ANCOVA comparisons revealed that manic and nonparanoid schizophrenic patients now either: 1) did not differ
### TABLE 8

**AMOUNT OF VARIANCE ACCOUNTED FOR BY THE MAINE SYMPTOM SCALES IN PARANOID AND NONPARANOID GROUPS**

<table>
<thead>
<tr>
<th>DEPENDENT MEASURES</th>
<th>PARANOID SCHIZOPHRENIC</th>
<th>NONPARANOID SCHIZOPHRENIC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MPS</td>
<td>MNPS</td>
</tr>
<tr>
<td><strong>FREE RECALL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRIAL 1</td>
<td>7%</td>
<td>6%</td>
</tr>
<tr>
<td>TRIAL 2</td>
<td>1%</td>
<td>6%</td>
</tr>
<tr>
<td>TRIAL 3</td>
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</tr>
<tr>
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</tr>
<tr>
<td>TRIAL 5</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td><strong>UNCATEGORIZED</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRIAL 1</td>
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<td>1%</td>
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</tr>
<tr>
<td>TRIAL 5</td>
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<td>0%</td>
</tr>
<tr>
<td><strong>PAIRED FREQUENCY</strong></td>
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<tr>
<td><strong>CATEGORIZED</strong></td>
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<td></td>
</tr>
<tr>
<td>TRIAL 1</td>
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<td>0%</td>
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<td>TRIAL 2</td>
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</tr>
<tr>
<td>TRIAL 3</td>
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</tr>
<tr>
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</tr>
<tr>
<td><strong>UNCATEGORIZED</strong></td>
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<td></td>
</tr>
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<td>2%</td>
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<tr>
<td><strong>SORTING RECALL</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>CATEGORIZED</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRIAL 1</td>
<td>1%</td>
<td>7%</td>
</tr>
<tr>
<td><strong>UNCATEGORIZED</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRIAL 1</td>
<td>0%</td>
<td>4%</td>
</tr>
</tbody>
</table>
from each other; or 2) did not differ from each other and differed from depressed patients. For those ANOVAs where depressed and paranoid schizophrenic patients were similar to each other but different from nonparanoid schizophrenic patients, ANCOVAs with GAS as covariate indicated that depressed and paranoid schizophrenic patients now differed from both manic and nonparanoid patients, while manic patients did not differ from the nonparanoid schizophrenic patients. Thus, when GAS was included as a covariate, manic and nonparanoid schizophrenic patients were similar to each other yet different from depressed and paranoid schizophrenic patients who were also similar to each other.

Finally, all groups were split into high and low symptom severity and high and low functional impairment subgroups based upon median splits for the symptom measures specific to each group and the GAS, respectively.

The following differences between high and low symptom severity subgroups within each diagnostic category were noted on the 3-way ANOVA for the multi-trial free recall task (Group x Trial x Type). When manic patients were split by symptom severity, main effects for Group [F(1,18)=4.28, p<.05] and Trials [F(4,18)=29.97, p<.0001] were significant. Both symptom subgroups showed a steady increase in recall across trials. Consistent with our hypothesis, the low symptom severity group recalled more categorized and uncategorized words than the high symptom severity group.

When depressed patients were split by symptom severity, significant main effects were found for the Group [F(1,18)=27.65,
p<.0001], Trials [F(4,18)=41.41, p<.0001] and Type [F(1,18)=33.45, 
p<.0001] conditions. Again, consistent with our hypotheses, while 
both symptom subgroups recalled consistently more words across 
trials, the low symptom severity subjects recalled more categorized 
and uncategorized words than high symptom severity subjects, while 
both groups remembered more categorized than uncategorized words 
across trials.

When paranoid subjects were split by symptom severity, both 
the main effect for Trials [F(4,16)=14.29, p<.0001] and the 
interaction for Group x Type [F(1,16)=6.64, p<.01] were 
significant. Although all symptom subgroups remembered more words 
across trials, the only difference with regard to low and high 
symptom severity groups was that the low severity paranoid subgroup 
recalled more categorized than uncategorized words while the high 
symmetry paranoid schizophrenics did not differ with regard to 
uncategorized vs. categorized recall.

Finally, when the nonparanoid schizophrenic group was split by 
symptom severity, both the main effect for Trials [F(4,17)=95.45, 
p<.0001] and the Group x Type interaction [F(1,17)=4.67, p<.01] 
were significant. Although the nonparanoid subgroups differed 
across trials with regard to recall, the increase across trials was 
not consistent. With regard to the Group x Type interaction, 
although the high symptom severity nonparanoid schizophrenics 
recalled more uncategorized than categorized words, the low symptom 
symmetry nonparanoid schizophrenics did not show this effect.
Groups were then split by GAS for the same multi-trial free recall data. For the manic subgroups, the Trials effect \( [F(4,18)=46.05, p<.0001] \) was the same as that found when split by symptoms. However, when split by GAS, the Group x Type interaction was now significant \( [F(1,18)=6.43, p<.01] \). The high functioning (GAS) manic patients remembered more categorized than uncategorized words, while the low functioning (GAS) manic patients remembered less categorized than uncategorized words.

For the depressed group, the main effects for Group \( [F(1,18)=10.15, p<.005] \), Trials \( [F(4,18)=44.71, p<.0001] \) and Type \( [F(1,18)=40.05, p<.0001] \) were again significant, yielding the same relationship among the conditions as for the symptom severity split.

As was the case for the symptom severity split, when paranoid subjects were split by level of functional impairment, the Trials \( [F(4,16)=50.76, p<.0001] \) and Group x Type interaction \( [F(1,16)=7.63, p<.01] \) were significant. Results identical to those of the symptom severity split were found when split by the GAS, with high functioning paranoid schizophrenics remembering more categorized than uncategorized words.

Finally, when nonparanoid schizophrenic subjects were split by impairment level, all main effects were significant: Group \( [F(1,17)=132.03, p<.0001] \), Trials \( [F(4,17)=41.49, p<.0001] \), and Type \( [F(1,17)=4.49, p<.05] \). Unlike the results from the symptom split, both high and low functioning nonparanoid schizophrenics remembered more categorized than uncategorized words for all
trials, with high functioning subjects remembering more of both types of words than the low functioning group.

**Inter-Trial Repetition.** A further evaluation of the subjective organization (Tulving, 1962) properties of memory was performed on the multi-trial free recall data by computing Bousfield and Bousfield's (1966) bidirectional Intertrial Repetition Measure (pair frequency) for each subject. Of all the subjective organization measures available, the pair frequency measure has been empirically demonstrated to be the most appropriate based upon the psychometric criteria of quantification, reliability, construct validity and empirical validity (Sternberg and Tulving, 1977). As may be seen in Equation 1, this measure consists of counting the number of pairs of items in adjacent positions on 't' and 't+1' trials (0), and subtracting from this sum the product obtained by subtracting 1 from the number of items common to the 't' and 't+1' trials (c), multiplying this value by the product of multiplying the number of common items by two, and then dividing this value by the product obtained by multiplying the total number of words from the 't' trial (h) by the total number of words from the 't+1' trial (k).

\[
\frac{2c(c-1)}{hk} \quad (1).
\]

A 3-way analysis of variance with one factor between (Groups) and two within (Trials and Type—categorized vs. uncategorized) was then performed for the pair frequency data. The main effects for Group \([F(4,85)=54.88, p<.0001]\); Trial \([F(4,85)=35.89, p<.0001]\); and
Type \( F(1,85) = 52.32, p < .0001 \) were significant. Normal subjects demonstrated more subjective organization than depressed patients who demonstrated more subjective organization than all other groups, while manic patients were characterized by higher levels of subjective organization than nonparanoid schizophrenics. All groups showed increases in subjective organization across trials, while all groups showed greater subjective organization for categorized than uncategorized trials.

The 3-way interaction \( F(12,84) = 1.89, p < .05 \) was also significant, indicating that with regard to pair frequency across trials for the uncategorized condition, control subjects demonstrated less subjective organization for the first pair frequency trial than all subsequent trials; depressed and manic patients demonstrated less subjective organization for the first pair frequency trial compared to the last trial; and neither paranoid nor nonparanoid schizophrenic patients manifested increases in subjective organization across pair frequency trials. For the categorized condition, results indicated that: 1) control subjects showed significant increases across all pair frequency trials; 2) for depressed patients, subjective organization was significantly lower on trials 1 and 2 compared to 3 and 4; 3) subjective organization on pair frequency trial 1 was significantly lower than on trials 2, 3, and 4 for the manic sample; 4) for paranoid schizophrenic patients, subjective organization on pair frequency trial 1 was significantly lower than on trial 3; and 5) no difference across pair frequency trials with regard to
subjective organization was found in the nonparanoid schizophrenic group. With regard to differences between groups, control subjects showed greater subjective organization than manic patients for categorized trials 3 and 4, and greater subjective organization than paranoid and nonparanoid schizophrenic patients for uncategorized trials 2 and 4 and categorized trials 3 and 4; control subjects did not differ from depressed patients for either condition. Depressed patients were characterized by higher levels of subjective organization than all patient groups on categorized trials 3 and 4. Finally, normal subjects, paranoid schizophrenic and depressed patients were characterized by higher levels of subjective organization on categorized than uncategorized trials 3 and 4; manic patients were characterized by higher levels for the second categorized trial; while nonparanoid schizophrenic patients were not found to differ with regard to subjective organization for either categorized or uncategorized lists.

In summary, these results indicate the following relationship between diagnosis, type of list (categorized vs. uncategorized), and trial for multi-trial free recall subjective organization. First, depressed patients did not differ from normal subjects on either categorized or uncategorized trials. Further, depressed patients demonstrated higher levels of subjective organization than manic and nonparanoid schizophrenic patients for the latter half of categorized trials, while manic and nonparanoid schizophrenic patients did not differ from each other. Second, although normal controls, paranoid schizophrenic and depressed patients
demonstrated higher levels of subjective organization for the latter half of categorized vs. uncategorized trials, manic and schizophrenic patients did not. Finally, normal controls demonstrated higher levels of subjective organization than both groups of schizophrenic patients for both categorized and uncategorized trials on the latter half of recall trials, while also being characterized by higher levels of subjective organization than manic patients.

The variance accounted for by the symptom severity and level of impairment ratings for the pair frequency data was computed and is presented in Table 7. Inspection of this table indicates that the first trial for both categorized and uncategorized conditions is most susceptible to disruption by these dimensions.

The effect of level of impairment on subjective organization was further examined by splitting the psychopathology samples by the functional impairment measure (GAS) and then comparing high and low severity groups within each sample on the multi-trial free recall task using a 3-way ANOVA (Group x Trial x Type) for the pair frequency data. When split by GAS, all main effects were significant: Group [F(1,16)=5.83, p<.01; F(1,17)=6.06, p<.01; F(1,18)=16.08, p<.0001], Trials [F(3,16)=2.86, p<.05; F(3,17)=6.58, p<.0001; F(3,18)=3.24, p<.05] and Type [F(1,16)=10.00, p<.005; F(1,17)=3.70, p<.05; F(1,18)=4.66, p<.05] conditions for the paranoid schizophrenic, nonparanoid schizophrenic and manic patient groups, respectively. Subjective organization was greater for high functioning versus low functioning subgroups of paranoid
schizophrenic, nonparanoid schizophrenic and manic patients, while all subgroups were characterized by greater levels of subjective organization for categorized than uncategorized words. Further, all subgroups showed an increase in subjective organization across trials, with trials 3 and 4 being characterized by higher levels of subjective organization than trial 1 for paranoid and nonparanoid schizophrenic patients, while trials 2, 3 and 4 were higher in subjective organization than trial 1 for the manic patients.

For the depressed sample, however, the Trial x Type interaction was significant \( [F(3,18)=4.99, p<.005] \), with both high and low functioning depressed subgroups characterized by greater levels of subjective organization for categorized than uncategorized words on trials 2, 3 and 4. Further, both groups of depressed patients showed a steady increase in subjective organization across trials in the categorized but not uncategorized condition—for the uncategorized trials, trial 4 was higher than 3 and 2, but not different than trial 1.

Hierarchical Cluster Analysis. The storage structure utilized by each group was further examined by performing a hierarchical cluster analysis (Johnson, 1967) for the categorized and uncategorized multi-trial free recall data. This computer program extracts clusters progressively ranging from the cluster of words recalled together by most subjects to those recalled together by the fewest subjects. Thus the clustering scheme depicts an hierarchical network of words based upon the interitem similarities perceived by the group (Koh et al., 1974). Each subject's final
multi-trial free recall for categorized and uncategorized trials was converted into a 16 X 16 incidence matrix, and then the individual matrices were summed across subjects for each group within each condition. The clustering schemes extracted for each group excluding the terminal cluster for the categorized recall, and uncategorized recall, are presented in Figures 2 and 3, respectively. Each rank-ordered node or cluster represents the item similarity in terms of the number of subjects who recalled words contiguously. Clusters were plotted according to number in which they were extracted; with frequency of endorsement decreasing moving from left to right.

As can be seen in Figure 2, normal controls, paranoid schizophrenic and depressed and manic patients were quite similar with regard to common clusters in the categorized free recall condition, utilizing the conceptual categories provided by the experimenter of colors, tastes, happy words, and depressed words. However, nonparanoid schizophrenic patients did not show the same degree of conceptual category utilization as did the normal, paranoid schizophrenic, depressed and manic groups. These results suggest that normal, depressed, manic, and paranoid subjects are able to utilize conceptual categories in their storage and retrieval of related words, while nonparanoid schizophrenics appear to be unable to do so to the same degree as these former groups.

Turning to an examination of the uncategorized clustering schemes in Figure 3 we see a different pattern emerging. Little overlap between clustering schemes was noted between groups,
Figure 2.
Hierarchical Clustering Shemes for Categorized Recall List, 5th Trial.
Figure 3.
Hierarchical Clustering Schemes for Uncategorized Recall List, 5th Trial.
suggesting that the psychopathology groups tend to organize "unrelated" words in memory different from both normal control subjects and from each other.

**Topographical Similarity.** In an effort to quantify the degree of topographical similarity between the clustering schemes, rank-order correlations based upon order of word extraction were computed. This measure provides an indication of the degree of similarity between groups regarding the relative strength of each cluster based upon the number of subjects who recalled or sorted items together. That is, the higher the positive correlation, the more similar the order of extraction between groups. Table 9 presents the rank order correlation values between each group for the categorized multi-trial free recall clusters.

The rank-order correlations indicate that groups tended to be quite different with regard to order of cluster extraction, indicating little or no relationship between cluster extractions with the exception of the correlation of control and depressed subjects with paranoid schizophrenic patients in the categorized and uncategorized recall conditions. Interestingly, a number of negative correlations were found, suggesting that group clusters were not extracted in the same order, but rather, cluster extractions showed an inverse relationship between some groups.

Hierarchical clustering schemes were also computed for the high and low subgroups for each diagnostic category. Following this, rank-order correlations were computed and are presented in Table 10. As can be seen in this table, with the exception of the
### Table 9

**Rank-Order Correlations Between Groups for Topographical Similarity of Categorized and Uncategorized Recall Clusters**

Uncategorized Recall (below diagonal) and Categorized Recall (above diagonal):

<table>
<thead>
<tr>
<th></th>
<th>CONTROL</th>
<th>DEPRESSED</th>
<th>MANIC</th>
<th>PARANOID SCHIZOPHRENIC</th>
<th>NONPARANOID SCHIZOPHRENIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTROL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEPRESSED</td>
<td>-.48</td>
<td>-.04</td>
<td>.39</td>
<td></td>
<td>.01</td>
</tr>
<tr>
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<td>-.16</td>
<td>-.33</td>
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</tr>
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<td>_uncategorized</td>
</tr>
<tr>
<td>------------------</td>
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</tr>
<tr>
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<td>SORT</td>
<td>RECALL</td>
<td>SORT</td>
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</tr>
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</tr>
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<td>.09</td>
<td>-.10</td>
<td>.12</td>
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</tr>
</tbody>
</table>
depressed groups, high functioning and low functioning groups differed in almost every case with regard to order of cluster extraction, indicating that although high and low functioning psychopathology subgroups received the same diagnosis, when split by functional impairment level differences emerged on cluster schemes following multi-trial free recall for both categorized and uncategorized word lists.

Subjective Organization Summary. The following differences and similarities were noted on the subjective organization in multi-trial free recall data. First, depressed subjects were indistinguishable from normal subjects on categorized free recall, while the recall of both depressed and paranoid schizophrenic patients was superior to that of the nonparanoid schizophrenics in this condition. Second, paranoid schizophrenics and depressed patients were also noted to be similar to each other and different from nonparanoid schizophrenic and manic patients when GAS was statistically controlled by analyses of covariance. Third, depressed subjects were again indistinguishable from normal subjects for both categorized and uncategorized subjective organization measures, while depressed, paranoid schizophrenic and normal subjects were all characterized by higher subjective organization scores on categorized vs. uncategorized trials. The subjective organization of manic and nonparanoid schizophrenic subjects did not differ on the categorized vs. uncategorized trials.
Fourth, although all groups except nonparanoid schizophrenics utilized the conceptual categories provided and were almost identical in their categorical clustering of words, all groups differed from each other in the uncategorized condition. Further, analyses of topographical similarity indicated that groups differed with regard to their cluster extraction hierarchies. Fifth, symptom severity and impairment level were found to be important considerations for many of these measures. This relationship was found to be diagnostic group specific. Further, symptom severity and functional impairment level splits produced different relationships within the manic and nonparanoid schizophrenic samples, suggesting that although related, these aspects of pathology tap different aspects of the pathology process. Finally, when split by functional impairment level, high and low functioning depressed patients did not differ on categorized trials with regard to subjective organization as measured by the pair frequency and topographical similarity measures.

Subjective Organization in Sorting

**Sorting Recall.** A 2-way analysis of variance with one factor between (Groups) and one factor within (Type—categorized and uncategorized) was performed for the sorting free recall data. Both main effects were significant: Groups \(F(4, 84)=10.26, p<.0001\); and Type \(F(1, 84)=67.92, p<.0001\). Normal subjects
recalled more words than all psychopathology groups, while depressed, manic and paranoid schizophrenic patients recalled more words than nonparanoid schizophrenic patients. All groups recalled more uncategorized than categorized words. The Groups x Type interaction was also significant [F(4,84)=3.75, p<.01], indicating that whereas groups did not differ with regard to recall of categorized words following sorting, normal control subjects recalled more uncategorized words than all patient groups, while depressed patients remembered more uncategorized words than all other patient groups. Finally, contrary to the multi-trial free recall results, all groups except nonparanoid schizophrenic patients remembered more uncategorized than categorized words following sorting.

The amount of variance accounted for by each severity measure was computed and is presented in Table 7. Although symptom severity and/or level of functioning accounted for moderate to high amounts of variance in the uncategorized condition, these measures accounted for minimal amounts of variance in the categorized condition.

ANCOVAs with GAS as covariate were compared to one-way ANOVAs for both the categorized and uncategorized sorting conditions. No group differences were found on either the categorized or uncategorized sorting recall conditions: that is, when impairment level was statistically controlled, the depressed subjects recall score was no longer greater than that of the other patient groups.
High and low symptom severity subgroups as well as high and low functional level subgroups were then compared on the sorting recall test. When split by symptom severity, the Type main effect for both the paranoid schizophrenic \( [F(1,16)=10.28, p<.005] \) and depressed \( [F(1,18)=13.64, p<.005] \) samples was significant, with both high and low symptom severity paranoid schizophrenic and depressed subgroups remembering more uncategorized than categorized words. Splitting the nonparanoid schizophrenic group by symptom severity yielded significant main effects for the Group \( [F(1,17)=12.05, p<.005] \) and Type \( [F(1,17)=6.37, P<.05] \) conditions. Whereas both high and low symptom severity subgroups remembered more uncategorized than categorized words, low symptom severity nonparanoid schizophrenics remembered more of both types of words than the high symptom severity group. Finally, splitting the manic group by symptom severity yielded a significant Group x Type interaction \( [F(1,18)=9.55, p<.01] \). The high symptom severity manic subgroup remembered less categorized than uncategorized words, while the low symptom severity group did not differ regarding recall of categorized vs. uncategorized words.

When split by level of impairment (GAS), the following differences were noted. The main effects for Group \( [F(1,16)=6.04, p<.05] \) and Type \( [F(1,16)=12.20, p<.005] \) were significant for the high vs. low functioning paranoid schizophrenic comparison, with the high functioning subgroup remembering more words of both type than the low functioning group, and both groups recalling more uncategorized than categorized words. As was the case when
depressed patients were split by symptom severity, the main effect for Type was significant, $[F(1,18)=14.12, p<.005]$ with both groups remembering more uncategorized than categorized words. When nonparanoid schizophrenic patients were split by impairment level, the Group x Type interaction was significant $[F(1,17)=5.79, p<.05]$. Whereas high functioning nonparanoid schizophrenics remembered more uncategorized than categorized words, no such difference was noted for the low functioning patients. Further, although high functioning subjects remembered more uncategorized words than low functioning subjects, groups did not differ with regard to recall of categorized words following sorting. Finally, when manic subjects were split by functional impairment level, the main effect for Type was significant $[F(1,18)=8.15, p<.01]$, with both groups of manic subjects recalling more uncategorized than categorized words.

**Clustering in Sorting.** Figure 4 presents the sorting cluster schemes for words from the same conceptual categories as presented in Figure 2: happy, depressed, color and taste. Inspection of these clustering schemes indicates that all subjects tend to utilize the same conceptual categories when sorting these words.

Turning to the clustering schemes in Figure 5, we see a moderate level of agreement between groups for sorting trials. Thus, all groups placed gift-diamond in the same pile, while all groups except depressed patients placed valley-earth in the same pile, and all groups except nonparanoid schizophrenic patients placed lake-camp in the same pile. Although significant differences for the remaining clusters based upon sorting
Figure 4.
Hierarchical Clustering Schemes for Categorized Sorting List.
Figure 5.
Hierarchical Clustering Schemes for Uncategorized Sorting List.
strategies are present, we see greater similarity between groups for the sorting vs. recall cluster schemes of uncategorized words, suggesting that the groups' storage properties of words in semantic memory are more similar than might be indicated from free recall results.

**Topographical Similarity.** Rank-order correlations between groups were computed based on the order of cluster extraction for the sorting task and are presented in Table 11. Uncategorized sorting correlations were moderate to high between all groups, while little such agreement was noted in the categorized condition, with the exception of the correlation between the nonparanoid schizophrenic and manic patients.

Groups were then split by the level of functioning and hierarchical clustering schemes computed for each subgroup. Rank-order correlations between subgroups based on order of cluster extraction are presented in Table 10. With the exception of the correlations between high and low functioning depressed patients, these correlations indicate little or no relation between high and low functioning severity subgroups.

**Sorting Summary.** Contrary to the results noted following multi-trial free recall, subjects recalled more uncategorized than categorized words following sorting. Further, the uncategorized condition appeared most susceptible to the effects of symptom severity and level of impairment for all groups. Additionally, the recall and clustering schemes of depressed patients appeared to be least influenced by these severity effects. It appears, therefore,
TABLE 11
RANK-ORDER CORRELATIONS BETWEEN GROUPS FOR TOPOGRAPHICAL SIMILARITY
OF CATEGORIZED AND UNCATEGORIZED SORTING CLUSTERS

Uncategorized Sorting (below diagonal) and Categorized Sorting (above diagonal)

<table>
<thead>
<tr>
<th></th>
<th>CONTROL</th>
<th>DEPRESSED</th>
<th>MANIC</th>
<th>PARANOID SCHIZOPHRENIC</th>
<th>NONPARANOID SCHIZOPHRENIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTROL</td>
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<td>-.23</td>
<td>.25</td>
<td>.19</td>
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</tr>
<tr>
<td>DEPRESSED</td>
<td>.63</td>
<td>-.20</td>
<td>.29</td>
<td>-.17</td>
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<tr>
<td>MANIC</td>
<td>.90</td>
<td>.49</td>
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<td>.47</td>
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<tr>
<td>PARANOID SCHIZOPHRENIC</td>
<td>.66</td>
<td>.64</td>
<td>.73</td>
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<tr>
<td>NONPARANOID SCHIZOPHRENIC</td>
<td>.52</td>
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that for all psychopathology groups except depressed patients, symptom severity and level of impairment are important considerations for both recall and subjective organization following sorting, especially for uncategorized materials.

Word Content Comparisons

Differences between groups regarding differential recall of happy or neutral vs. depressed content words and affective vs. nonaffective words were then examined.

Depth of Processing. A 4-way analysis of variance with one factor between (Groups) and three factors within (Level of Processing, Content—depressed vs. nondepressed, and Type of response—yes vs. no) was performed for the depth of processing data. The following main effects and interactions were significant: Level [F(2,85)=16.02, p<.0001]; Type [F(1,85)=11.67, p<.0005]; Level x Content [F(2,85)=7.50, p<.0001]; and Level x Content x Type x Group [F(10,85)=2.20, p<.01]. Main effects indicated that groups recalled more semantic and self-reference judgement than structural judgement self-reference words, and recalled more yes than no judgement words. The Level x Content interaction indicated that subjects: 1) recalled more self-reference than semantic and more semantic than structural judgement words in the nondepressed content condition; 2) recalled more self-reference and semantic than structural judgement words in the depressed content condition; and 3) recalled more nondepressed than depressed content words in
the self-reference judgement condition.

The four-way interaction was then examined. Although normal and manic subjects recalled more nondepressed than depressed content words, the depressed, paranoid schizophrenic and nonparanoid schizophrenic patients did not show differential recall of depressed vs. nondepressed content words: that is, the latter three groups recalled equivalent numbers of both types of words. Further, normal and manic subjects recalled more yes-rated self-reference nondepressed content words than nonparanoid subjects. Finally, although normal, depressed and manic patients recalled more yes than no judgement words, and more self-referential and semantic than structural words, neither paranoid nor nonparanoid schizophrenic subjects were characterized by such differences between types of words recalled.

A 4-way ANOVA with groups split by the depressed mood measure (POMSDEP) for the depth of processing data was then performed. Although effects for type of rating (yes vs. no) and level of processing (structural vs. semantic vs. self-referent) were significant for each psychopathology subgroup comparison, the hypothesized Group x Content interaction (i.e. that the high-depressed mood group would recall more depressed than nondepressed words and that the low-depressed mood group would recall less depressed than nondepressed content words) was not significant for any patient subgroup comparisons (all p's >.10). Thus, current mood-state did not appear to have an effect on word-recall content in the depth of processing task.
Multi-Trial Free Recall. A 5x5x2 3-way ANOVA with one factor between (Groups) and two within (Trials and Type—happy vs. depressed) was performed for the multi-trial free recall categorized condition. All main effects were significant: Groups \[(F(4,84)=38.96, p<.0001);\] Trials \[(F(4,84)=45.06, p<.0001);\] and Type \[(F(1,84)=23.45, p<.0001).\] Normal subjects recalled more words than all patient groups, while depressed patients recalled more words than the manic and both schizophrenic groups. Both manic and paranoid schizophrenics recalled more words than nonparanoid schizophrenics. Further, groups recalled more happy than depressed content words, while recall for both types of words increased across trials.

The 3-way interaction \[(F(16,842.36, p<.005),\] was significant, however. An examination of this interaction indicated that groups remembered more words across trials with the exception of the manic and nonparanoid schizophrenic patients in the happy content condition. Regarding differences between groups on trials, the only difference was that control subjects recalled more happy content words than nonparanoid schizophrenic patients on trial 5. Finally, with regard to content differences between groups: 1) depressed patients recalled equivalent numbers of depressed and happy content words; and 2) control subjects, manic, paranoid and nonparanoid schizophrenic patients recalled more happy than depressed content words on trials 2, 3 and 5; 2; 4 and 5, and 2 and 3, respectively.
The recall of happy vs. depressed content words for high vs. low depressed mood conditions within patient groups was compared in a series of 2x5x2 ANOVAs for the multi-trial free recall condition.

The main effect for Trials \([F(4,17)=25.63, p<.0001]\) and the Group x Type interaction \([F(1,17)=7.13, p<.01]\) were significant for the nonparanoid schizophrenic group, with the high depressed mood subgroup recalling more depressed than happy content words.

For the paranoid schizophrenic group, main effects for both Group \([F(1,18)=6.00, p<.01]\) and Trial \([F(4,18)=11.16, p<.0001]\) were significant, indicating that the high depressed mood paranoid recalled more than the low depressed mood subjects and that recall for words increased across trials. However, both the Trial x Type \([F(4,18)=2.45\) and Group x Type \([F(1,18)=3.30, p<.06]\) interactions were significant, indicating that: 1) recall increased steadily across trials for the happy but not depressed content words; and 2) the low depressed mood subgroup remembered more happy than depressed words.

Both the Group \([F(1,18)=5.96, p<.01]\) and Trial \([F(4,18)=15.07, p<.0001]\) main effects were significant for the depressed group, with the low depressed mood patients recalling more words overall than the high depressed mood patient, while both subgroups showed an increase in recall across trials.

Finally, the Group \([F(1,18)=7.75, p<.01]\) and Trial \([F(4,18)=3.98, p<.005]\) main effects were significant for the manic sample. As was the case for the depressed sample, the low depressed mood subgroup recalled more words overall than the high
depressed mood subgroup. However, the only difference on trials was that trial 1 recall was lower than that for all subsequent trials. The Trial x Type \([F(4,18)=3.21, p<.01]\) interaction were significant for the manic sample. Thus, although both subgroups increased their recall of depressed content words across trials, this did not occur for the happy content words.

A 5x5x2 3-way ANOVA for the multi-trial free recall data with content split into affective (happy and depressed) and nonaffective (color and taste) types was then performed. Both the Trials main effect \([F(4,84)=73.50, p<.0001]\) and the Group x Type interaction \([F(4,84)=4.04, p<.005]\) were significant. All groups recalled more words of both types across trials. All groups remembered more affective words than nonparanoid schizophrenic patients, while control subjects remembered more neutral words than the manic and both schizophrenic groups. Additionally, depressed patients remembered more neutral words than nonparanoid schizophrenic patients. Finally, although normal subjects and both groups of schizophrenic patients remembered more neutral than affective words, the affective disordered groups (manic and depressed) were not characterized by this recall pattern.

Content and Sorting Recall. A 5x2 2-way ANOVA for content (happy vs. depressed) of sorted words in the categorized condition was then performed. Only the main effect for diagnosis was significant \([F(4,84)=3.95, p<.01]\), with control subjects remembering more words of both types than all patient groups except the depressed group, who in turn remembered more words than nonparanoid
schizophrenic patients. Thus groups did not differ with regard to recall of happy vs. depressed content words following the sorting task.

With regard to the sorting task, the only mood-group differences noted were between the nonparanoid schizophrenic subgroups for the Group x Type interaction \[F(1,17)=4.74, p<.05\], with the high depressed-mood subgroup recalling more depressed than happy words.

Finally, a 5x2 2-way ANOVA for recall following categorized sorting was performed with words divided into affective and nonaffective content categories. The Group x Type interaction was significant \[F(4,84)=2.78, p<.05\]. Control subjects recalled more neutral words than nonparanoid schizophrenic patients, while nonparanoid schizophrenic patients recalled more neutral than affective words. No other differences were significant.
DISCUSSION

Symptom Severity and Mood Measures

The results of this study provide strong support for the convergent and divergent validity (Campbell and Fiske, 1959) of the symptom severity measures employed. That is, symptom severity measures specific to depressed, manic and schizophrenic pathology were found to reliably differentiate between groups in the expected direction. Thus, depressed patients were characterized by the highest levels of depressive symptomatology, manic patients by the highest levels of manic symptomatology, and schizophrenic groups by the highest levels of schizophrenic symptomatology. Further, with the exception of the depression rating for the schizophrenic and manic samples, patient and control samples did not differ from each other on the nondominant symptomatology measurement scales. For example, control, depressed and manic subjects differed from both schizophrenic groups but not each other on both the NHSI and SADSCHIZ.

As noted previously, significant levels of depressive symptomatology were noted in the nondepressed patient samples, particularly the schizophrenic samples. These results are consistent with earlier reports which have noted schizophrenic...
patients to be characterized by moderate levels of depressive symptomatology as indicated by both interview and self-report measures (Johnson, Magaro & Stern, 1984; Moller & von Zerssen, 1982; Siris, Harmon & Endicott, 1981). As every effort was made to exclude patients of questionable diagnosis, these results are probably not due to the inclusion of schizo-affective subjects in the schizophrenic samples. Although the present data does not allow for a determination of the sequence of depressive and schizophrenic symptoms, they nevertheless validate earlier investigations reporting the presence of depressive symptomatology in schizophrenic patients.

The symptom measures were characterized by high correlations between measures of the same symptom domain, while correlations between measures of different symptom domains either approached zero or were in a negative direction. However, within patient groups, these symptom measures were not so discrete. These results, especially the correlations between the mania and schizophrenia symptom measures in the schizophrenic samples, are consistent with the recent focus upon the similarity between affective and schizophrenic symptomatology (Pope & Lipinski, 1978; Andreasen, 1983). Although able to differentiate between groups, the within group correlations of these measures suggest that severity of symptoms from different psychopathological domains are related, and may be tapping some common symptom severity factor.

**Impairment Level.** With regard to the level of impairment index, the GAS, we see a strong relationship between symptom severity and
impairment level, with high levels of functioning associated with low symptom severity rating. Again, these results are quite consistent with our earlier investigation (Johnson et al., 1984). Although not surprising, these results do suggest that the GAS is an easy to use, valid instrument for the measurement of functional impairment due to the presence of psychopathology. Given the recent interest in separating core versus symptom processes and the attention to level of severity as a confounding variable (Otteson & Holzman, 1976; Holzman, 1982; Neuchterlein, Phillips-Yonas, Driscoll & Garmezy, 1982), the present results suggest that the GAS would be quite useful to investigators as a measure of this important dimension.

Given the high correlation between the SADS-C subscales and corresponding symptom severity measures, these results support our earlier position (Johnson et al., 1984) arguing for the utility of the SADS-C as a sensitive measurement device for presence and severity of affective and schizophrenic symptomatology. Although somewhat truncated in its coverage of manic symptoms (5 symptom domains on the SADS-C as opposed to 11 on the BRMS), the SADS-C appears to be a valid independent rating instrument for both presence and severity of symptom domains covered. Coupled with reports of the high reliability of the SADS scales (Matarazzo, 1983), when used in conjunction with the GAS, the SADS-C should provide investigators with a concise, reliable and valid symptom severity and level of impairment measurement device. As the correlations between symptom severity measures and the GAS are far
from unity, these results further suggest that although related, symptomatology and impairment level are separate dimensions of psychopathology.

Mood Level. An extremely high correlation was found between the depressed mood measures, the CLYDEDEP and POMSDEP, suggesting that both self-report measures were tapping very similar content domains. As these measures were moderately to highly correlated with the depression symptom scales and as depressed patients scored highest on these measures, it is probably safe to conclude that these scales were indeed measuring depressive mood-state. Although clearly related to severity of depressive symptoms, these measures nevertheless appear to be measuring some aspect of experience not accounted for by symptom severity. Coupled with earlier reports of the validity of these scales as mood measures (Moran & Lambert, 1983), these results suggest that these self-report inventories provided an adequate evaluation of current mood-state along the depressed-mood continuum.

Signal Detection

The lack of difference between groups on the signal detection task measures (d' and beta) appears to be at the same time both consistent and inconsistent with the literature in this area. Whereas Koh et al. (1973) found no difference between schizophrenic, depressed and normal control subjects on these measures, Whitehead (1973), Larner (1977) and Miller and Lewis (1977) found depressed patients to adopt a conservative response
criteria in relation to their comparison groups. The key to these apparently disparate findings may lie in sample differences between the latter reports and the present investigation. While subjects examined by Koh et al. (1973) were young, nonpsychotic schizophrenic and depressed patients, the samples in the latter studies were all elderly (over age 65) patients. Further, depressed patients in the latter studies were compared to either physically ill or demented subjects, rather than other psychiatric groups. Given that subjects in the present sample were all under 45 years of age, the difference between the present study which did not find differences and those which did may be due to age differences between the samples and/or differences in the control groups employed. Additionally, Whitehead (1973) included subjects who had recently been given a course of ECT, while both Miller and Lewis (1977) and Larner (1977) failed to use standardized diagnostic procedures, instead relying upon the diagnosis of the attending physician. These procedural difficulties may also have contributed to the disparity between these studies and the present investigation.

The fact that the Koh et al. (1973) study and the present investigation yielded similar results and were similar with regard to both age and control group compositions provides further evidence for this interpretation. Regardless of these considerations, the signal detection analysis results from the present investigation suggest that the differences between groups on the remaining measures were not due to different response
criteria as determined by beta.

Attention

Groups were remarkably consistent with regard to the attentional measure. That is, all subjects were found to be attending to the stimuli when evaluated at each five second interval. Further, observations by the experimenter during the tasks even when subjects were not being rated confirmed that subjects were attending to the stimuli as required by the protocol. When the attention measure results are considered in conjunction with the results of the signal detection task, it appears that the "non-cognitive" aspects of the testing situation (response bias and lack of attention) do not account for the effects noted on the remaining measures.

Memory and Subjective Organization

As noted on the multi-trial free recall task, although normal subjects recalled more words than patient groups in the uncategorized condition, normal and depressed patients were found not to differ in the categorized condition. These results indicate that only the depressed patients as a group were able to make effective use of the conceptual categories provided. In retrospect, however, it is possible that the reason normal control subjects did not exceed the recall of depressed patients on the categorized list was due to a ceiling effect; that is, normal subjects recalled close to the maximal number of words possible.
This effect could further account for the fact that the categorized recall of the normal subjects did not exceed that of the uncategorized condition. However, despite this possibility, these results are consistent with earlier investigations which found normal control subjects to exceed the recall of depressed and schizophrenic patients on uncategorized trials but to not differ from depressed patients on categorized trials (Koh et al., 1973; Weingartner et al., 1981). Thus, increasing the number of to-be-remembered words may not actually change the recall relationship in the categorized condition between depressed and normal subjects.

Turning to an examination of differences between psychiatric patient groups, both paranoid schizophrenic and depressed patients were found to recall more words than nonparanoid schizophrenic patients, while manic patients did not differ from these groups. These results are consistent with the meager literature concerning cognitive processes in mania which have found no difference between manic and nonparanoid schizophrenic patients on tests of cognitive controls (Otteson & Holzman, 1976) and selective attention (Oltmanns, 1978). Thus, these results extend this literature which indicates that manic patients are difficult to distinguish from schizophrenic patients on tests of cognitive ability.

Both paranoid schizophrenic and depressed patients were found to recall more words than the nonparanoid schizophrenic patients and not to differ from each other in the categorized condition. These results suggest that these two groups may share some process in common which is different from that of the nonparanoid
schizophrenic patients. One such process which might account for this similarity is that both paranoid schizophrenic and depressed patients tend to process information from a schema-driven perspective (Beck, 1967; Beck et al., 1976; Magaro, 1980; 1984). That is, although the content of the dominant schemata in these conditions are quite different, what they do share is an organizational property, the propensity to overutilize schemata in their processing of stimuli. Nonparanoid schizophrenic and manic patients, however, are considered to be either stimulus-driven (Magaro, 1980; 1984) or disorganized and idiosyncratic (Henry et al., 1971), respectively, in their processing of information. Thus, the proclivity to conceptualize the world from a schema-based information processing perspective may have aided the recall for words organized into conceptual categories in the paranoid schizophrenic and depressed patient samples. That is, the conceptual categories provided may have acted to provide associational or schema-type networks, facilitating their organization and later recall for individuals able to utilize such strategies.

This position can be further bolstered by examining the subjective organizational properties for categorized and uncategorized words in these groups. Although normal subjects and depressed patients recalled more categorized words than all other groups, normal control subjects, paranoid schizophrenic and depressed patients all had higher levels of subjective organization for categorized vs. uncategorized lists, while nonparanoid
schizophrenic and manic patients did not demonstrate this difference. Thus, whereas the former three groups utilized the inherent organizational properties of the categorized list, the latter two groups did not. If we might consider the subjective organization results as measuring the ability to establish an associational network, then it appears that nonparanoid schizophrenic and manic patients are deficient in this ability. Further, as depressed patients were found not to differ from normals with regard to subjective organization in the categorized condition, these results suggest that this may in fact have been due to the adequate organizational properties of the depressed patients' memory.

We also noted that, with the exception of nonparanoid schizophrenic patients, all groups possess the proper conceptual categories as indicated by their hierarchical clustering schemes. Thus, the low recall of manic patients does not appear to be due to an absence of proper conceptual categories, while the nonparanoid schizophrenic recall deficit appears to in part be due to either an absence or disruption of these categories. That is, although both manic and nonparanoid schizophrenic patient samples were characterized by similar deficits, the processes underlying these deficits appear to be different.

In conclusion, examination of the subjective organizational properties of memory in these patient groups suggests the following processes may be responsible for the results obtained. First, it is suggested that depressed patients perform comparably to normal
control subjects when information is presented with an inherent conceptual structure due to their ability to utilize such categories to store and retrieve information. This position is supported by the finding that depressed patients did not differ from normal subjects with regard to either the formation of associational networks or their possession and use of the categories as presented. Second, the similarity between paranoid schizophrenic and depressed patients regarding their reliance upon schematic encoding processes may have accounted for both groups' ability to recall more categorized words than nonparanoid schizophrenic patients. Additionally, we found that although manic patients appear to possess the same conceptual categories as normal control subjects, they are inconsistent and deficient with regard to utilizing such structures to store information. Thus, these results lead us to a conclusion similar to that of Henry et al. (1971); that manic patients organize information in a loose and idiosyncratic manner. Finally, we found that nonparanoid schizophrenic patients were characterized by deficiencies regarding use of conceptual categories, as well as an absence/disruption of these categories in memory.

At first glance the results of the sorting procedure appear to be at odds with those found on the multi-trial free recall task. Foremost among these apparent contradictions was the finding that groups recalled more uncategorized than categorized words. These contradictions may be due to procedural differences between the tasks. First, subjects were provided with only one trial in the
sorting condition as opposed to five trials in the multi-trial condition; second, unlike the multi-trial task, recall in the sorting condition was unexpected; and third, subjects were explicitly directed to sort words that went together in the same pile, whereas no such organizational instruction was offered to subjects in the multi-trial condition. Of the three differences, the third may perhaps be the most critical. Whereas in the categorized sorting condition conceptual categories are provided, such categories are conspicuously absent in the uncategorized condition. Thus, in the categorized condition, we might consider that less effort is necessary to place words into categories when these categories are readily apparent and provided by the experimenter. However, in order to group words together in the uncategorized condition, subjects were required to expend more effort in order to find some common element which would allow for the placement of words into the same pile. As was noted earlier, effort at encoding is considered to be a crucial element in the storage and recall of information. This fact, coupled with the observations of subjects during this task, suggests that subjects did indeed expend more effort in their sorting of uncategorized words. Therefore, the task requirement for subjects to establish their own conceptual groupings in the uncategorized recall condition may have produced greater uncategorized recall as a result of more effort expended in this condition. Further, psychiatric subjects were often observed to establish "story lines" by which words were sorted—that is, the mnemonic strategy of
providing a context for the to-be-remembered items was utilized by a number of subjects. As providing a meaningful context has been demonstrated to enhance recall (Crowder, 1976; Lachman et al., 1979), the tendency to sort words utilizing this principle may further account for the greater recall of uncategorized than categorized words.

In summary, it appears that when recall is intentional, conceptual categories provide a useful mnemonic device which facilitates recall by providing an associational network for normal control subjects, paranoid schizophrenic and depressed patients. However, as was found by Koh et al. (1981) with schizophrenic patients, when recall was unexpected, degree of effort and/or the production by subjects of their own associations in the uncategorized sorting condition were the most salient and useful for recall. Thus, although these results were consistent with previous results regarding both categorized vs uncategorized recall (Koh and colleagues; Nachmani & Cohen, 1969) and the manner in which subjects sort categorized and uncategorized words (Koh et al., 1974), the present results provide further insight into differences both within and between groups regarding recall following multi-trial and sorting tasks. Further, by including a number of psychiatric samples, we were able to examine similarities and differences between seemingly disparate groups, such as the similarities noted between paranoid schizophrenic and depressed patients.
Symptom severity and functional impairment were both found to be important factors in the organization and recall of verbal stimuli. Although the results were consistent with our hypothesis, high and low levels of symptom severity and functional impairment lead to different outcomes depending upon the diagnostic group. While high levels of symptom severity resulted in lower recall in the multi-trial condition for both manic and depressed patients, symptom severity appeared to be more specific to the categorized condition in the schizophrenic groups. Thus, the results for the affective groups are quite consistent with the hypothesized relationship between severity of pathology and recall performance.

For paranoid schizophrenic patients, high levels of symptom severity appear to interfere with the ability to take advantage of the inherent relationship among to-be-remembered stimuli. Given the earlier suggestion that the recall of paranoid schizophrenic subjects is facilitated in the categorized condition by their reliance upon schematic organizational properties considered to be a core cognitive process of this disorder, we might further speculate that high levels of symptomatology interfere with efficient use of schematic processes. The exact nature of this interference is not discernable from the design of the present investigation. Thus, although operating in a manner different from that of the affective groups, we nevertheless see symptom severity
as an important aspect of recall in the paranoid schizophrenic condition.

Nonparanoid schizophrenic patients recalled more uncategorized than categorized words in the high symptom severity condition, while patients in the low condition did not differ on the categorized and uncategorized recall. As previous investigators (Koh et al., 1981) and the present investigation found schizophrenic patients to show deficient recall for affective vs. neutral words, the recall results for nonparanoid schizophrenics may be due to the affective content of the categorized words. That is, the higher recall of uncategorized than categorized words may reflect content aspects of the categorized list rather than reflecting organizational properties.

Recall data from the sorting task was generally in line with the severity hypothesis, although again, this relationship was found to be group contingent. Although the recall of depressed and paranoid schizophrenic patients was not affected by symptom severity in the sorting condition, symptom severity was disruptive for the nonparanoid schizophrenic and manic patients. Thus the effects of symptom severity appear to be task as well as group specific.

In summary, the sorting and multi-trial free recall data suggests that symptom severity plays an important, albeit diagnostically specific role, in the recall of English words. Investigations which have failed to consider this dimension appear, therefore, to be plagued by a serious confound.
Level of impairment was also found to be important with regard to word recall. Although, results similar to the symptom split were found for the paranoid schizophrenic and depressed patient samples when split by level of functioning on the multi-trial free recall data, nonparanoid schizophrenic and manic patient symptom splits produced results different than those obtained when split by level of functioning. Similar to the multi-trial free recall data, differences between the symptom severity and functional impairment splits were found for the sorting data. These results indicate that like symptom severity, functional impairment plays an important role in the recall of verbal material. The difference between functional impairment level and symptom severity provides further support for the earlier contention that level of functioning and symptom severity are different aspects of psychiatric illness (Magaro, 1980; 1984). Thus, future research in this area would do well to not only measure level of pathology as indicated by severity of symptomatology, but to also include a measure of functional or impairment level as well.

The importance of the severity dimension of pathology was further supported when the pair frequency and topographical similarity subjective organization measures were examined and contrasted between high and low functional impairment level subgroups for each diagnostic sample. The low rank-order correlations between high and low subgroups for all but the depressed group suggested that impairment level differences result in different methods of subjectively organizing information in
memory. More telling were the results of the pair frequency subjective organization measure. When groups were split for impairment level and compared on this measure, all subgroups but those derived from the depressed sample were found to differ, with high functioning subgroups characterized by higher levels of subjective organization than the low functioning subgroups. Taken together, these results provide strong support for the contention that severity of pathology plays a crucial role in organizational properties in memory. The interesting exceptions to this rule were the depressed subgroups who did not differ significantly on these measures. Apparently, although depressed subjects may be evaluated as significantly impaired with regard to functional ability, this is not mirrored on a cognitive level by their ability to organize English words in memory.

Thus, the results of the split by symptom severity and level of functioning are fairly consistent with previous results (Calev et al., 1983) and our hypotheses based upon a review of the literature regarding the role of severity in organizational properties in memory. That is, both symptom severity and functional impairment were found to affect recall following multi-trial free recall, sorting recall and subjective organization. As the relationship of symptom severity was in many instances not identical to that of impairment level, these results supported Magaro's (1980; 1984) position that these dimensions are oblique factors present in psychiatric illness. Obviously, these results suggest that future investigators in this area must take these
factors into account. Further, by including a number of psychiatric groups it was found that the relationship of these variables to recall and subjective organization was not as straight-forward as originally conceived; that is, the effect of symptom severity or functional impairment was in part conditional upon diagnostic category.

Word Content and Mood State

Although the basic depth of processing effects were replicated in this study (Craik & Tulving, 1975; Koh & Peterson, 1978), these results did not support the main hypothesis regarding differential recall of depressed vs. nondepressed word content in the depressed group. That is, although normal subjects and manic patients showed greater recall for nondepressed vs. depressed content words, paranoid and nonparanoid schizophrenic and depressed patients did not show such differential recall. The difference between the present results and those of previous investigators may be in large part due to sample selection differences. As noted earlier, a number of investigators have examined undergraduate college students identified by their scores on the BDI, or have selected control groups for their absence of depressive symptomatology. Thus, although these aspects of the design do not explain the absence of an effect for word content in the depressed group, they do shed some light on why depressed patients did not differ from the schizophrenic patient groups: that is, the fact that the schizophrenic groups were found to be characterized by moderate
levels of depression may account for the lack of difference between
our depressed and nondepressed patient samples.

The present results are, however, in accord with previous
studies which have demonstrated that depressed and schizophrenic
patients show an absence of differential recall of happy or neutral
over depressed content words (Ingram et al., 1983; Koh et al.,
1981). That is, whereas normal subjects tend to show a "Pollyanna"
effect for recall of positive vs. negative words about the self
(Boucher & Osgood, 1969), depressed and schizophrenic patients have
been found not to manifest these tendencies. Additionally,
disturbance of affect has been considered to be a hallmark of
schizophrenia since the early part of this century. Rado (1956;
1962) has proposed that anhedonia, a generalized pleasure deficit,
characterizes the schizophrenic disorders. The present findings
are quite in line with these positions, as our normal as well as
manic sample did indeed show this Pollyanna tendency by recalling
more neutral than depressed content self-referent words. As groups
were found not to differ with regard to total number of words
recalled, this difference does not appear to be due to differences
in overall recall ability. Therefore, these results suggest that
rather than depressed patients being characterized by a diagnostic-
specific bias toward recall of depressed content words (Derry &
Kuiper, 1981; Kuiper & Derry, 1982), depressed patients may be
characterized by a negative self-schema whose principle
characteristic might be the absence of the normal Pollyana tendency
found in nonpsychiatric normal subjects. Further, the lack of
differential recall between depressed and nondepressed content words by the schizophrenic samples are consistent with the characterization of schizophrenics as anhedonic.

Yet when we consider recall of depressed vs. happy content words, this relationship does not hold. That is, when recall of happy rather than neutral words is compared to recall of depressed words, depressed subjects only were characterized by a lack of happy vs. depressed content words, while manic and schizophrenic patients and normal subjects were characterized by greater recall of happy vs. depressed content words. Not only are these results inconsistent with the depth of processing results for the schizophrenic samples, but they are also inconsistent with earlier reports showing schizophrenic patients do not differentially recall happy vs. depressed content words (Koh et al., 1976; 1981). In fact, given the moderate levels of depression found in the schizophrenic patient samples, we might have expected the opposite results. Given the anomalous nature of these results, and the fact that this differential recall was not found following sorting, these results are probably due to chance occurrences resulting from the large number of analyses performed.

Finally, with regard to the affective dimension of the multi-trial free recall words employed in this study, it was found that although manic and depressed patients recalled the same number of affective and neutral words, normal control subjects and paranoid and nonparanoid schizophrenic patients recalled more neutral than affective words. Thus the affectively disordered groups were found
to recall equivalent numbers of affective and neutral words, while the schizophrenic and normal groups recalled less affective than neutral words. These results suggest that the affective dimension of words may be more potent for encoding and retrieval in patients with affective disorders. That is, patients with affective disorders may be primed to attend to the affective dimensions of words. By extrapolation, we might hypothesize that the affective dimension of experience in general might be prepotent for patients with affective disorders, whereas this is not the case for normal control subjects and schizophrenic patients. Therefore, although similarities have been found with regard to organizational properties in memory between manic and nonparanoid schizophrenic patients on the one hand, and depressed and paranoid schizophrenic patients on the other, depressed and manic patients appear to be similar to each other with regard to potency of affective material in the content domain.

The expected effect of mood-state by and large was not supported in the affectively disordered groups. However, these results were consistent with previous investigations which found that depressed patients do not recall more happy or neutral than depressed content words (Ingram et al., 1983; Breslow et al., 1981). Rather than being related to word content, mood-state in the affective disorders (both manic and depressed) seems to be linked to recall overall as suggested by the fact that both low depressed-mood affective groups recalled more words overall than the high depressed-mood condition. Thus, mood-state appears to be
related to recall in the same manner as symptom severity in the affective disorders, disrupting recall and memory. It appears, therefore, that in affectively disordered groups mood-state is not as differentiated from symptom processes as was expected. Contrary to the hypotheses offered here, mood-state may in fact be closely tied to core symptom aspects of the affective disorders with regard to memory.

However, the hypothesis was supported in the nonaffective psychiatric groups; that is, current mood-state was found to be related to word content in the paranoid and nonparanoid schizophrenic samples. In conclusion, the present results suggest that mood-state is closely related to affective pathology in affectively disordered patients, whereas for schizophrenic patient groups mood does appear to be a bit more oblique to diagnosis and symptom severity considerations as posited by our model.

Summary and Conclusions

What then, might we conclude based upon these results? First, it appears that the model offered regarding the relationship of mood-state and severity of illness to memory was able to predict many of the effects for certain groups. Further, it appears that the current model was much too general regarding the conceptualization of memory. Additionally, functional impairment and symptom severity produced differential effects both within and between the dependent measures employed. Thus, when one considers memory processes in psychopathology, one must not only consider the
specific diagnostic entity, but also approach "memory" itself from a molecular rather than molar perspective.

We also found that the effect of mood-state on recall was again diagnosis dependent. Although the proposed model accounted nicely for the results of the schizophrenic samples, it failed to do so in the affectively disordered samples. These results suggest that mood-state may indeed be intimately related to pathology in affectively disordered patients, while mood-state is a more oblique factor in nonaffective psychiatric disorders.

In conclusion, the following processes were found to characterize each psychopathological group.

**Depressed Patients.** Depressed subjects were found to be most similar to normal controls with regard to organization and memory. It is suggested that these results were due to the depressive's predilection to conceptualize the world utilizing schema-driven processes. Thus, although the memory of depressed patients was in some instances inferior to that of normal subjects, this deficiency was probably not due to an absence or impairment of organizational processes utilized during the learning of verbal material.

Unlike the normal control and other psychiatric samples, depressed patients were not characterized by the normally present tendency to recall more positive than negative affectively toned words. Coupled with the observation that depressed subjects recalled more affective than neutral content words, it appears that affective words may be prepotent for depressives, who lack a self-
serving recall bias for positively toned words in general and about
the self. That is, depressed patients appear to be primed to
attend to the affective dimensions of verbal material, yet fail to
demonstrate the normal recall bias which is conducive to the
maintenance of a positive self-image.

Finally, some memory processes of depressed patients were
susceptible to disruption by mood state, and to a lesser extent,
symptom severity. Thus, self-reported depressed mood is at least
as potent as overt symptomatology in its effect on memory function
for these patients. Although the manner by which this occurs is
presently unclear, these results indicate that when considering
memory processes in depression, care must be taken to control for
these potentially confounding dimensions of psychopathology.

Manic Patients. Although manic patients were found to possess
organizational schemata similar to normal subjects, they were
unable to utilize these properties to their full potential.
Further, manic patients were characterized by difficulties in
establishing stable organizational patterns which may have lead to
further recall deficits. Thus, mania appears to disrupt the
establishment of stable organizational patterns, even though the
basis for forming conceptual frameworks may be unimpaired, leading
to idiosyncratic and loose associational patterns, and hence poorer
recall.

As was the case with depressed patients, mood-state was
related to overall recall ability rather than differential recall
of depressed vs. happy content words. Mood-state in the affective disorders is crucial to the memory ability of both manic and depressed patients. Level of functioning was also found to relate to memory processes in mania. Although the effects of mood-state and functional impairment on memory are certainly deserving of further investigation, researchers not directly examining this relationship must at least account for and control the effects of these variables on their dependent measures.

Like depressed patients, manic subjects recalled more affective than neutral words. Manics differed from depressed patients, however, with regard to content of the affective words recalled, recalling more happy than depressed content words. Thus, although both affective disorder groups were characterized by higher recall of affective words, groups differed with regard to the type of affective word recalled. Whether this is due to the presence of the normal Pollyanna effect in manics, or is due to a mania-specific encoding strategy for happy words is not clear at this time. What is clear is that although manic and depressed patients share a preference for affective material, both the content and structural organizational properties for each are markedly different.

Paranoid Schizophrenic Patients. Paranoid schizophrenics, like manic and depressed patients, were also found to have intact conceptual categories. Although their recall performance was deficient when compared to normal subjects, paranoid schizophrenics
demonstrated an ability to utilize the categories provided as mnemonic cues and organizational aids. It was also noted that in some instances the performance of paranoid schizophrenics was similar to that of depressed patients. Again, this similarity may be due to the reliance of both groups on schematic processing strategies, which aided recall and organization.

As expected, paranoid schizophrenics recalled equivalent numbers of affective and neutral words. Yet as normal subjects also demonstrated this overall recall pattern, it is unclear if this was due to schizophrenic anhedonia or simply reflected "normal" performance on this task.

Although the severity dimensions were overall found not to affect recall, organizational aspects of memory were affected by functional impairment. Given that recall was not affected by this dimension, it appears that paranoid schizophrenics were able to somehow compensate for the disruption.

Finally, as predicted, mood-state was found to be related to word content, producing increased recall for mood-congruent materials. Thus, the more self-reported depressed mood present, the more depressed mood content words recalled.

**Nonparanoid Schizophrenic Patients.** Of all the groups, nonparanoid schizophrenics were most impaired with regard to both memory and ability to organize information. Thus, unlike paranoid schizophrenics but similar to manics, these subjects were characterized by disorganized associational patterns and poor
overall memory. Unlike all other groups, nonparanoid schizophrenics were also noted to have either lacked or failed to utilize the conceptual categories provided, which may have contributed to the recall as well as organizational deficits.

The performance of nonparanoid schizophrenics was also found to be quite susceptible to the effects of symptom severity and functional impairment. As predicted, these dimensions of psychopathology appear to be directly related to recall and organization in this group.

Finally, as with the paranoid schizophrenics, mood-state dependent recall was noted. Thus, the hypothesized relationship between mood-state, severity of pathology, and memory received strong support in the nonparanoid schizophrenic sample.

As was the case with the affective groups, similarities and differences between the schizophrenic groups were noted. Interestingly, a number of similarities were noted between paranoid schizophrenic and depressed patients, and between nonparanoid schizophrenic and manic patients. Although these relationships may reflect a "final common pathway", an understanding of the basis for these similarities should provide further insight into the cognitive aspects of psychopathology.
REFERENCES


Sciences, 3, 55-65.


## APPENDIX A

**Multi-Trial Free Recall Stimulus Words**

<table>
<thead>
<tr>
<th>List 1 (Uncategorized)</th>
<th>List 2 (Categorized)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotel</td>
<td>Weary</td>
</tr>
<tr>
<td>Ticket</td>
<td>Weak</td>
</tr>
<tr>
<td>Vessel</td>
<td>Unwanted</td>
</tr>
<tr>
<td>Pipe</td>
<td>Troubled</td>
</tr>
<tr>
<td>Nail</td>
<td>Elated</td>
</tr>
<tr>
<td>Chair</td>
<td>Excited</td>
</tr>
<tr>
<td>Dust</td>
<td>Happy</td>
</tr>
<tr>
<td>Flood</td>
<td>Glad</td>
</tr>
<tr>
<td>Rock</td>
<td>Silver</td>
</tr>
<tr>
<td>Lark</td>
<td>Green</td>
</tr>
<tr>
<td>Engine</td>
<td>Pink</td>
</tr>
<tr>
<td>Infant</td>
<td>Orange</td>
</tr>
<tr>
<td>Judge</td>
<td>Sour</td>
</tr>
<tr>
<td>Queen</td>
<td>Sweet</td>
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<tr>
<td>Ghost</td>
<td>Tangy</td>
</tr>
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<td>Shadow</td>
<td>Salty</td>
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### APPENDIX B

**Sorting Stimulus Words**

<table>
<thead>
<tr>
<th>List 1 (Uncategorized)</th>
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<tbody>
<tr>
<td>Valley</td>
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<td>Toast</td>
<td>Loser</td>
</tr>
<tr>
<td>Ship</td>
<td>Melancholy</td>
</tr>
<tr>
<td>Rattle</td>
<td>Unlucky</td>
</tr>
<tr>
<td>Painter</td>
<td>Cheerful</td>
</tr>
<tr>
<td>Machine</td>
<td>Pleased</td>
</tr>
<tr>
<td>Lake</td>
<td>Joyous</td>
</tr>
<tr>
<td>Ink</td>
<td>Jolly</td>
</tr>
<tr>
<td>House</td>
<td>Lavender</td>
</tr>
<tr>
<td>Gift</td>
<td>Red</td>
</tr>
<tr>
<td>Fabric</td>
<td>Yellow</td>
</tr>
<tr>
<td>Earth</td>
<td>Purple</td>
</tr>
<tr>
<td>Diamond</td>
<td>Bland</td>
</tr>
<tr>
<td>Bird</td>
<td>Spicy</td>
</tr>
<tr>
<td>Camp</td>
<td>Tart</td>
</tr>
<tr>
<td>Arrow</td>
<td>Bitter</td>
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</tbody>
</table>
## APPENDIX C

### Depth of Processing Stimulus Words

<table>
<thead>
<tr>
<th>Card</th>
<th>Word</th>
<th>Type</th>
<th>Card</th>
<th>Word</th>
<th>Type</th>
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<td>1</td>
<td>White</td>
<td>(B) 1</td>
<td>22</td>
<td>Defeated</td>
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<td>2</td>
<td>Large</td>
<td>(B) 2-A</td>
<td>23</td>
<td>Criticized</td>
<td>(D) 3</td>
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<tr>
<td>3</td>
<td>Short</td>
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<td>24</td>
<td>Courteous</td>
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<tr>
<td>4</td>
<td>Bleak</td>
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<td>25</td>
<td>Amiable</td>
<td>(ND) 2-A</td>
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<td>5</td>
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<td>(ND) 2-A</td>
<td>26</td>
<td>Helpless</td>
<td>(D) 1</td>
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<td>6</td>
<td>Loyal</td>
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<td>27</td>
<td>Inquiring</td>
<td>(ND) 2-S</td>
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<tr>
<td>7</td>
<td>Inadequate</td>
<td>(D) 3</td>
<td>28</td>
<td>Forceful</td>
<td>(ND) 3</td>
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<td>8</td>
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<td>Downcast</td>
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<td>Assertive</td>
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<td>(D) 1</td>
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<td>14</td>
<td>Dismal</td>
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<td>35</td>
<td>Dull</td>
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<td>15</td>
<td>Consistent</td>
<td>(ND) 2-S</td>
<td>36</td>
<td>Capable</td>
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<td>16</td>
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<tr>
<td>17</td>
<td>Blue</td>
<td>(D) 2-A</td>
<td>38</td>
<td>Helpful</td>
<td>(ND) 1</td>
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<tr>
<td>18</td>
<td>Hasty</td>
<td>(ND) 3</td>
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<td>Downhearted</td>
<td>(D) 2-S</td>
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<tr>
<td>19</td>
<td>Forlorn</td>
<td>(D) 3</td>
<td>40</td>
<td>Smooth</td>
<td>(B) 2-A</td>
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<tr>
<td></td>
<td>Word</td>
<td>Type</td>
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<td>(D)</td>
<td>2-S</td>
<td>41</td>
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<td>Curious</td>
<td>(ND)</td>
<td>1</td>
<td>42</td>
<td>Important</td>
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**NOTE:**
- STRUCTURAL=1
- SEMANTIC=2
- SELF-REFERENT=3
- ANTONYM=A
- SYNONYM=S
- DEPRESSED CONTENT=D
- NONDEPRESSED CONTENT=ND