Journal of Abnormal Psychology
1977, Vol. 86, No. 3, 276-284

Mood-State-Dependent Retrieval of Verbal Associations

Herbert Weingartner, Halbert Miller, and Dennis L. Murphy
National Institute of Mental Health, Bethesda, Maryland

Retrieval of previously self-generated events in the form of verbal associations was observed to be mood-state dependent in individuals who cycled between states of mania and normality. Recall of associations was more complete during periods of relatively stable mood, including periods of mania, compared to the reproduction of associations that were generated and retrieved during periods of disparate mood. The findings are discussed in the context of mood-state-specific encoding and storage of events and subsequent mood-state-specific retrieval of experience.

Mood states appear to determine how experienced events are processed, stored, and later retrieved from memory (Henry, Weingartner, & Murphy, 1973; Miller, 1975; Murphy, Henry, & Weingartner, 1973). Many of the findings relating mood state, learning, and recall have emerged from the study of patients who demonstrate a bipolarity in mood swings. These patients demonstrate periods of normal mood as well as episodes of depression and mania, with accompanying changes in brain catecholamine activity (Murphy & Redmond, 1975). Learning and memory appear to be disrupted during both the manic and the depressed phase of this disorder, and the extent to which such cognitive changes take place is a function of the intensity of the disturbance in mood (Henry et al., 1973). In a depressed phase, patients appear to be able to attend to input events and to form a temporary memory trace of experience, but they appear to be unable to retrieve experience after periods of delay. However, if these patients are treated with the precursor of the biogenic amine neurotransmitter dopamine, L-dopa, then this specific mood-related facet of the memory-learning deficit appears to be erased, but without an immediate associated lifting of mood (Henry et al., 1973). This finding suggests that during the depressed phase of a bipolar mood disturbance, the consolidation of trace events is impaired, which may be related to a disturbance in catecholamine activity in the brain with consequent changes in brain-state arousal and activation. Such changes in brain-state arousal have previously been shown to alter memory consolidation in animals (McGaugh & Herz, 1972) as well as in man (Weingartner, Hall, Murphy, & Weinstein, 1976).

During manic episodes, these same patients also demonstrate disturbances in learning and memory, but these disturbances appear to be related to changes in the encoding processes involved in transforming and organizing meaningful events (Henry, Weingartner, & Murphy, 1971). One index of how events might be interpreted or encoded is manifest in the pattern of verbal associates that are elicited to common word events (Weingartner, Snyder, Faillace, & Markley, 1970). When such changes in associative patterns take place, the storage and recall of events are also systematically altered. While these patients are manic, the associates that they produce in response to single-word stimuli become more idiosyncratic. These changes in associative responses to word events produce parallel changes in learning and recall that include predictable distortions of to-be-remembered events (Henry et al., 1971).

In studying bipolar patients, we noted that while manic, they would often recall events from memory that appeared to be "lost" or inaccessible when normal state had been

Requests for reprints should be sent to Herbert Weingartner, National Institute of Mental Health, Laboratory of Psychology and Psychopathology, Building 10, Room 2N246, Bethesda, Maryland 20014.

reinstated. In a subsequent manic episode, these same "forgotten" events could then be recalled again. It appeared to us that these patients demonstrated a mood-related dissociation of memory similar to that seen in drug-related state-dependent learning. In the present study, we examined and tested whether mood-change-related memory dissociations would be evident for events that were clearly already stored and available in memory.

State-dependent learning has been frequently demonstrated in animals and more recently in man, and it can be elicited with a wide variety of learning–memory procedures using various drugs, including alcohol, marijuana, and barbiturates. Simply stated, the effect is demonstrated when learning that has occurred in some drug state is retrieved better when the organism is similarily drugged than it is when the organism is in an undrugged or a different drug state, even though the drug may be disruptive to learning or performance. Retrieval of information is, in part, dependent on reinstituting the brain-state context that was present when the to-be-remembered events were encoded and stored in memory. Information that appears lost in disparate-state recall is, in fact, available but temporarily inaccessible (Eich, Weingartner, Stillman, & Gillin, 1975).

The tasks that are most sensitive to dissociative drug effects are those that require the recapitulation of episodic events, whether environmental occurrences or self-generated events (Weingartner & Eich, in press). This inaccessibility of events stored in memory appears to be a consequence of context-specific encoding of information, which requires the presence of the same retrieval context for successful recall of items from episodic memory (Tulving & Thomson, 1973).

Not only is newly acquired learning susceptible to dissociation when recall is tested in some disparate drug state, relative to storage or learning state, but self-generated events, presumably already in the memory store, are also less likely to be recalled when subjects are required to regenerate them in a different state (Weingartner, Eich, & Allen, 1973). Recall of these same self-generated associations would, in part, be dependent on reinstituting the same brain-state context present at the time the responses were first generated. Presumably, such self-generated events as streams of word associations in response to word stimuli reflect characteristics of the encoding of the stimulus word, a process which is itself brain-state specific.

In the present study, we investigated the role of changes in mood state in determining the retrieval of self-generated word associations. Successful recall of word events was predicted to be dependent on congruence in mood state at the time of their generation and regeneration. Specifically, we tested whether patients switching into or out of a manic mood state would be less likely to reproduce a self-generated pattern of associative responses than they would under conditions of state congruence, for example, while remaining either in a manic or in a more normal mood state.

Typically, the state-dependent learning paradigm includes at least four test conditions for learning and recalling events. Two of these involve a congruence of state at the time of storage and retrieval, for instance, learn in drugged state—recall in a similar drug state, learn in an undrugged state—recall in a similar drug-free state. The other two conditions represent a disparity in storage and retrieval state, for instance, learn in a drugged state—recall in a drug-free state, and the reverse of this condition. The present study deviated from this format in that state was not manipulated directly, as would be the case in using a drug at a fixed dose and testing at a fixed point in time following drug treatment. Instead, state was defined by clinical rating along a continuum of mood-state changes that occurred as a spontaneous expression of bipolar affective illness. A procedure was used that was easy to administer, was expected to be sensitive to state-dependent memory dissociations, required little time or extended effort by the patients, used events to be recalled that were in the patient's memory store, and could be repeated many times. In addition, the task was expected to be sensitive to encoding differences in different mood states. It appeared that a task in which the subjects themselves defined the to-be-remembered events, as in a multiple free-

association paradigm, would be a simple test for possible mood-state-related retrieval of events in memory.

Method

Eight patients with histories of affective disturbance were systematically studied over periods of 8 to 20 weeks. The experiment was conceptualized as eight replications of the same basic experimental design in which subjects regularly generated, stored, and later retrieved information while in either the same or some altered mood state. The unit of analysis for testing intrasubject mood-state-dependent retrieval was the relation between the number of associations retrieved from memory and the amount of change in a mood as assessed by behavioral ratings of clinical state. That is, the difference between mood state measured at the time of generation of to-be-remembered responses and mood state measured at the time this information was to be retrieved from storage represented the focal measure for testing mood-state-dependent retrieval. It was anticipated at the outset of the study that while hospitalized, each of these bipolar patients would exhibit wide fluctuations in mood, with demonstrated periods of mania and normal affect as well as some periods of depression. Therefore, we could expect to see occasions when the patients would move from normal mood into mania or from mania into normal mood (disparate states) as well as periods during which the patients would maintain either a manic or depressed mood or a normal mood.

On each testing occasion, the to-be-remembered self-generated events consisted of 20 discrete single-word free associations to each of two different standard nouns (Palermo & Jenkins, 1964). The patients were asked to generate 20 free-associative responses to each of two stimuli randomly drawn from these norms. Four days later, the patients were again presented with these word stimuli and were asked to recall their associative responses. They were then presented with two new equivalent stimuli, in response to which they were asked to produce 20 new associations. The procedure was continued at 4-day intervals with equivalent material throughout the period of hospitalization. The subjects were given initial practice on procedures and were required to complete the generation of associations in less than 4 minutes for each set of 20 responses.

We assumed that if we systematically studied patients with this procedure over a long enough period of time, we would obtain generation–retrieval occurrences during periods of stable mood (congruent conditions) and during changing mood states (disparate conditions) when patients were moving into or out of a manic episode. These conditions can be viewed as comparable to those tested in drug-induced state-dependent-learning studies. Although the eight patients studied received psychoactive drugs (principally lithium carbonate) during the course of their hospitalization, in the case of only four of the eight patients was the drug regimen altered during the period of study, and the period of drug change was associated with less than 5% of the generation–retrieval test trials.

Changes in mood state were measured by a series of clinical mood-relevant scales that had previously been standardized and assessed for their reliability and validity (Beigel & Murphy, 1971; Beigel, Murphy, & Bunney, 1971; Murphy, Beigel, Weingartner, & Bunney, 1974). These mood scales had also been tested and used in experimental studies in which behavior and mood change were drug induced and were related to a number of other psychophysiological dependent measures (Henry et al., 1973). The mood scales were constructed as subsets of 34 behavioral items descriptive of depressed, manic, and normal mood states. Each of these 34 items was in turn made up of two component 5-point scales, one descriptive of the frequency and the other of the intensity of some mood-relevant behavior. In standardizing the scale, we found that the 34 items yielded 10 clusters of items, with each cluster measuring a somewhat different aspect of disturbance in mood—mania, elation–grandiosity, paranoid–destructive behaviors, depressed ideation, agitated depression, retarded depression, anxiety, anger, psychosis, and confusion. The scales measuring mania, elation–grandiosity, and paranoid–destructive behaviors were found to be particularly relevant in the assessment of the manic phase of bipolar illness, whereas those measuring depressed ideation, agitated depression, and retarded depression were focally relevant in assessing depressed mood swings.

In addition to using these clusters of scales in the present study we also completed and used clusters of scales derived from a factor analysis of multiple ratings of these same 34 items. The data for this analysis were derived from a systematic study of 35 newly admitted patients with demonstrated histories of affective disturbance. Trained clinical raters rated the frequency and intensity of the patients' behavior on each of the 34 items. Ratings were made by at least two raters for each patient at three different points in time. The reliability of these ratings was not significantly different from previously observed reliability estimates (Murphy et al., 1974) and was above $r = .90$ ($p < .001$ on all the scales used). These data were then subjected to a factor analysis, which yielded a factor structure in which the first four factors accounted for 74% of the rating-scale variance (Murphy et al., 1974). The factors appeared to designate aspects of affective disturbance that were somewhat different from those described above, and we arbitrarily labeled them as Factors 1 through 4.

Finally, in our previous studies, we had found that a global assessment of clinical mood state was highly correlated with ratings of mood measured by the clusters of items defined above. Furthermore, these global mood-state assessments were no less reliable than the ratings on individual scales. We therefore included these global assessments of mood state as

yet another, albeit redundant, measure of mood state. These measures included global assessment of mania, depression, psychosis, anxiety, and anger, among which mania and depression were of particular interest and relevance to the study of clinical state in these patients.

Trained clinical staff rated the patients' behavior on all scales on the days on which the subjects generated free associations and on the days on which they regenerated their responses. Ordinarily, at least two independent raters rated behavior, and the scale measure used was the average of the two measures for each of the 34 scale items and for the five global scales. Each scale score could vary from 0 to 25 (the product of the intensity and frequency ratings). Finally, on the basis of these scores, the clinical mood state of each patient was represented by a composite average score for each of the 10 scale clusters and for the scales making up each of the four empirically derived factors. Each of the five global-scale measures was a single multidimensional measure of mood that was used in its unmodified form. In summary, a total of 19 scaled measures of mood state were collected on each day of testing for each patient. These measurements were made by protocol-blind raters throughout the course of the study.

The method of analysis used in this study was primarily correlational, both for the data generated by all eight subjects (181 pairs of learning–recall observations) and for the data used in a similar analysis accomplished on those patients for whom at least a dozen pairs of learning–recall measures were available (five of the eight patients). Partial and multiple correlations were obtained relating three measures of mood—the level or intensity of mood disturbance at the time associative responses were generated, this same measure at the time of retrieval, and the absolute change in mood state between the time of generation and regeneration of associative responses—with the probability with which these associative responses could be recalled. The correlational analysis of all the pooled data ignored individual differences and for purposes of a descriptive correlational analysis, made the assumption of independence for the 181 pairs of observations obtained from the continued observation of the eight patients studied.

Results

The total number of associations that were successfully reproduced was found to be significantly negatively correlated with absolute change in mood as measured by 17 of the 19 scales used to assess clinical mood state. These data are summarized in Table 1. Retrieval of associations was related also to the initial level or intensity of the clinical mood state present at the time of generation of the associations and not merely to the magnitude of state change. Correlations measuring the relation between the initial intensity of clinical mood state, using the same 19 measures, and the retrieval of associations yielded a pattern of significant negative correlations that was of approximately the same strength as the pattern obtained by relating change along these same scales with retrieval. Combining the measures of mood change and intensity of mood state at the time of response generation as a joint predictor of the reproducibility of associations yielded substantially higher negative correlations than those obtained by using either of these measures separately. The average multiple correlation relating both mood-state change and intensity of mood state when associations were generated with retrieval probability was found to be $-.35$, and all the multiple correlations for the 19 scales were statistically significant ($p < .01$). These findings are presented in Table 2. Finally, the clinical mood state present at the time of reproduction of associations also tended to correlate negatively with retrieval, but to a far lesser extent than did the mood state present at the time of generation. That is, although all the correlations involving retrieval mood state were negative for the clusters of scales described in Tables 1 and 2, only six were large enough to be significantly different from chance.

A further integration of clusters of scales was also accomplished, and changes in these composite clusters demonstrated a stronger relation between mood-state change and the likelihood of reproducing a pattern of associations 4 days later. The clusters of scales that are particularly pertinent in assessing mania had previously been shown to be mania, elation–grandiosity, paranoid–destructive behavior, and global mania. When the change-in-mood values from all four of these clusters of scales were combined, they yielded a correlation of $-.45$ ($p < .001$) with the reproducibility of associations. Likewise, combining the change-in-mood values derived from all four of the clusters defined by the factor analysis of the 34 scales produced a similar moderate negative correlation with the number of reproduced associations ($r = -.47$, $p < .001$). These data are displayed in Figure 1. The pattern of multiple correla-

Table 1
Correlations Relating Absolute Change in Rated Mood State ($T^1 - T^2$)[a] and the Reproduction of Associations

Mood measure	r*
Scale clusters	
Mania	−.23
Elation–grandiosity	−.14
Paranoid–destructive behaviors	−.29
Depression	−.16
Agitated depression	.17
Retarded depression	−.28
Anxiety	−.29
Anger	−.16
Psychosis	−.29
Confusion	−.33
Empirically defined clusters of scales	
Factor 1	−.26
Factor 2	−.36
Factor 3	−.19
Factor 4	−.26
Global measures of mood state	
Global mania	−.26
Global depression	−.08
Global psychosis	−.30
Global anxiety	−.27
Global anger	−.20

[a] T^1 = production of associations, T^2 = reproduction of associations.
* Correlations greater than .14 are significantly different from chance ($p < .05$).

tions relating intensity and change in depressed mood with the retrieval of previously generated associations was consistently negative for all of the pertinent clusters of scales. However, the strength of these relations was weaker than that seen in relating intensity and change in mania with the reproduction of associations.

We were able to study five of the eight patients systematically for a sufficiently long period of time to obtain multiple observations during periods of relatively stable mania, during episodes of normal mood, and during switch states in which patients moved from relative normality into mania and from mania into a period of mood normalization. We did not, however, note any instances in which patients cycled so rapidly that mood shifts measured every 4 days would effectively miss changes in clinical state. The average number of associations that could be reproduced during stable nonmanic periods was 8.4 words; this was different from the average number of associations retrieved during stable periods of manic mood (5.7 words, $p < .05$). However, fewer words were reproduced during episodes of change into mania (4.4 words) and out of mania in the direction of a normalization of mood (2.9 words, $p < .05$). This pattern of results was consistent with the correlations observed utilizing all 181 pairs of observations in the eight patients studied. That is, retrieval was most successful when associations were reproduced in the same state as was present at the time of their generation. In addition, associations were more effectively retrieved during stable periods of nonmanic mood than they were during periods of sustained mania.

All the patients in the sample experienced one or more clearly manic periods during their course of hospitalization, but the manner in which these individuals expressed manic mood varied to some extent. Some patients expressed mania with more psychotic

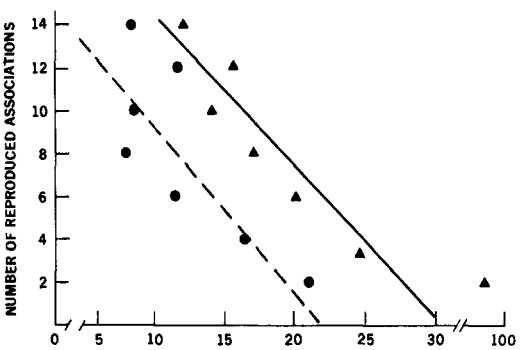

Figure 1. The relation between the number of reproduced associations and the absolute change in clinical mood state. (The circles represent four theoretically defined clusters of behavioral scales descriptive of mania [mania, elation–grandiosity, paranoid–destructive behavior, and global mania], and the triangles represent four empirically defined clusters of scales derived from a factor analysis of the entire 34-item behavior scale used to describe changes in mania. Each point in the figure shows the relation between the average number of reproduced associations [for all the patients who were manic at various times during the period of observation] and change in mood along the theoretically and empirically defined composite mania scales. The latter change scores could vary from 0 to a maximum of 100. Each point represents from 16 to 38 pairs of observations.)

(e.g., paranoid) symptoms, whereas others exhibited greater depressive ideation or anger along with their manic symptoms. These individual differences in manic behaviors had been noted in previous studies and partially account for the multidimensional character of the scales, which appears to be necessary to adequately describe and scale the manic state (Murphy et al., 1974). These systematic individual differences in the manifestation of mood change were used to further characterize the relation between mood-state change and the retrieval of associations, which was accomplished by using the data from the five patients who had been observed over a long enough period of time to permit reliable intrasubject analysis of mood-state change. In three of these patients, mood change as measured by the scale clusters for mania, global mania, elation–grandiosity, and paranoid–destructive behavior was strongly negatively correlated with retrieval ($r = -.39, -.59, -.64$; $p < .01$). The remaining two patients demonstrated a strong relation between retrieval and mood change as measured by the four empirically derived mania scales (Factors 1 to 4), which seemed to tap different facets of the manic state ($r = -.51, -.57$; $p < .01$).

Table 2
Multiple Correlations Relating Both the Intensity of Mood State (T) and Change in Mood State ($T^1 - T^2$)[a] with the Reproduction of Associations

Mood measure	r*
Scale clusters	
Mania	−.29
Elation–grandiosity	−.20
Paranoid–destructive behaviors	−.32
Depression	−.26
Agitated depression	−.26
Retarded depression	−.34
Anxiety	−.41
Anger	−.25
Psychosis	−.45
Confusion	−.42
Empirically defined clusters of scales	
Factor 1	−.29
Factor 2	−.44
Factor 3	−.45
Factor 4	−.25
Global measures of mood state	
Global mania	−.28
Global depression	−.35
Global psychosis	−.54
Global anxiety	−.41
Global anger	−.26

[a] T^1 = production of associations, T^2 = reproduction of associations.
* Correlations greater than .14 are significantly different from chance ($p < .05$).

Discussion

The core finding that emerges from the present study is that associations or episodic events generated from semantic memory can be regenerated more completely in a similar mood state than they can in a different mood state. This change in cognition related to changes in mood can be considered from a number of vantage points: (a) Marked shifts away from normal mood, and the clinical syndrome represented by such disturbances in mood, produce a global impairment in cognitive functioning. (b) Just as drug state or an informational context induces specific encodings and interpretations of events, in a similar manner, mood state, too, might provide a context for the production of one kind of associative pattern in one state and a different pattern when mood state is altered. (c) Because the production of associations as self-generated events represents events stored in episodic memory, their recall is state dependent, and state can be defined by mood. (d) A similar interpretive framework for these findings would be that events stored in memory, regardless of whether they are part of semantic or episodic memory, are retrieved in a state-specific manner and that differences in mood are related to discrete strategies for searching for stored trace events. These different interpretive frameworks, and their implications for understanding how mood might alter cognition, are by no means mutually exclusive, as will be seen when they are explored in greater detail.

Possibly the simplest, but least informative, interpretation of the present findings is that during periods of mood disturbance, patients perform all kinds of tasks poorly (Miller, 1975). They learn poorly, remember events

with greater difficulty, and have trouble concentrating and attending to ongoing tasks and environmental events. In short, they show an overall performance deficit, which is also mirrored in the kinds of associations they produce and their reproduction of these associations. And indeed, some of the findings in the present study support such a notion. For example, reproduction of associations was less complete not only as a function of change in mood but also in relation to the intensity of manic or depressive symptoms present at the time of generation and retrieval of those associations. However, the fact that associations produced while a patient was manic were more effectively reproduced during a period of mania than during a period when the patient was no longer manic suggests that a simple relation between disturbance in mood and deficits in performance cannot adequately account for all of the findings.

A great deal of current memory research has emphasized the role of context-specific encoding of events and related context-specific retrieval strategies that operate when searching memory for previously encoded and stored events. In much of this research, context has been specified or manipulated by characterizing the informational field, or orienting set, that would in turn determine how to-be-remembered events are interpreted and encoded. Such specific encodings also determine some of the contextual conditions that are necessary to retrieve events from memory effectively (Tulving & Thomson, 1973). Context need not be restricted to an informational field that might function to bias an interpretation of an event; it can also be defined as a mood state or, more generally, a brain state present at the time an event is processed and stored in memory (Weingartner & Murphy, in press). In fact, certain discrete pharmacological manipulations of brain state have been shown to directly alter the encodings of events, and such brain-state-specific contexts have produced dissociations of recall when retrieval has taken place in a disparate state. A similar shift in encoding and retrieval strategies that is mood-state specific may account for some of the dissociative effects observed in the present study.

Associations elicited by stimuli constitute one measure of how events are encoded. Our earlier findings suggested that such encodings of events are in fact different in different mood states (Henry et al., 1973). In the present study, the regeneration of associations in a different mood state was less complete than retrieval in a congruent mood state. This finding can be considered a manifestation of mood-state-specific retrieval as well as mood-state-specific encoding of events. When trying to recall earlier associative responses generated in a disparate mood state, subjects merely interpret the stimulus differently, and this difference is reflected in the kinds of associations that come to mind at the time of regenerating the pattern of associations produced earlier. Although this explanation may be a very plausible one for the findings of the present study, it represents an incomplete formulation of how such state-specific encodings are manifested under conditions in which subjects are asked to search their memory for stored events.

In a sense, when associations to stimuli are elicited, subjects are asked to search semantic memory to produce relevant word responses. When regenerating these same associations, however, they are in effect searching both semantic and episodic memory—"Did I produce this response before? Even though this word is a relevant or reasonable response, did I produce it four days ago when presented with the stimulus word *butterfly?*" In effect, both types of memory are involved in this task. Furthermore, an individual's previous semantic knowledge and experience about some event and the role of semantic memory in the analysis and encoding of an event are necessary for tagging the event as having occurred at some time in a given context and in some place in a sequence of ongoing behavior. That is, semantic and episodic memory processes are necessarily interrelated. What is chosen as an appropriate encoding or interpretation of some event is represented in terms of both semantic and episodic memory trace components.

As was pointed out earlier, the structure of the design in the present study is similar to that used in studies on state-dependent learning in man, in which subjects are ordinarily required to learn information in a given

brain state and later to retrieve events either in the same or in some disparate state. Such research has shown that recall of events in a disparate state is less complete for a number of reasons. Subjects appear to encode events differently in one state compared to another (Weingartner & Faillace, 1971; Weingartner & Murphy, in press). Dissociations in disparate-state recall are also related to the initial depth of learning and to the type of retrieval test used by subjects in accessing memory (Weingartner & Eich, in press). In fact, when memory for previously processed events is tested by providing powerful cues as prompts at the time of retrieval, disparate-state dissociations can be erased. Furthermore, it appears that disparate-state dissociations in recall are also determined by the kinds of responses that subjects recall first in attempting memory search for stored events. That is, items recalled serve as cues for accessing other items, and though available, certain information may be inaccessible because of the kinds of events that have already been retrieved and emitted on recall. The major thrust of these recent findings is that the dissociations seen in state-dependent learning paradigms can be better understood in terms of state-dependent retrieval than in terms of state-dependent learning. What appears to be "lost" in recall relates to the manner in which subjects sequentially search out information available in memory. Recall may appear to fail because subjects retrieve events in an inappropriate sequence.

We tested this notion with some of the available data in the following manner. From each patient we chose sequentially generated pairs of items that were in fact successfully recalled in either a congruent or a disparate mood state. We randomly chose 16 such pairs that had been produced and reproduced during mania, during periods of normal mood, and during switch states into mania and out of mania. We then examined the sequential relation of those successfully recalled responses in those four conditions.

We found that in congruent-state recall, sequentially linked responses were more likely to be reproduced together as an intact pair than they were under disparate-mood retrieval conditions. In addition, when such pairs were not maintained at the time of retrieval, the sequential ordering of these response pairs was more likely not to be maintained when retrieval occurred in a disparate mood state. What appears to be lost in the disparate retrieval state is sequential organization and information that appears to cement events together in episodic memory. These sequential organizational markers appear to be state specific so that when searching memory in a disparate state, subjects cannot access events because they use an inappropriate sequential retrieval strategy to scan stored event structures.

In the present study, the subjects in fact learned nothing new but merely demonstrated what was in memory storage in relation or response to single-word stimuli. Asking them to regenerate such events 4 days later can be considered, conceptually, not different from asking them to again produce 20 discrete but sequential response words to these same stimuli. Whether the task is viewed as one of regenerating or recalling responses or one of again producing a pattern of responses to a word stimulus, it nevertheless requires constancy in the retrieval accessing strategies that are used to search what is in memory. The search of memory store may be for episodic events—"What did I say last time?"—or for events in semantic memory—"What comes to mind for the stimulus word right now, regardless of what I said four days ago?" In either case, the search strategies used to access memory in the retrieval process seem to be not only drug-state specific (Weingartner et al., 1973) but also mood-state specific.

The findings presented here suggest that mood state determines not only how we encode events but also how we search memory or how we decide what are the relevant, meaningful features of an event. This appears to be the case irrespective of whether we are processing an external event, such as a word, or searching our memory for previous events, either those that occurred around us or those that were self-generated by us. The findings in this study appear to extend the arena of the phenomenon of state-dependent learning or state-dependent retrieval. The manner in which life events are scanned, coded, and

stored in memory may be determined not only by drug state but also by mood state. Such mood-state specificity appears to provide a context in which memory store is scanned, events are retrieved, and then experience is interpreted. This context for remembering may include central nervous system representations of discrete mood states along with associated retrieval strategies or plans for effecting recall of stored information.

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Received June 18, 1975
Revision received January 27, 1977 ■