Mood, Recall, and Selectivity Effects in Normal College Students

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In three experiments we explored the relation between normal variation in depressed mood and memory in college students. Subjects read and subsequently recalled stories whose protagonists experienced good, bad, and neutral events. Contrary to predictions arising independently from capacity theory and from schema theory, the recall of depressed and nondepressed subjects did not differ in either overall level or in affective content. The results are not easily handled by a conceptualization of depression, tied to schema theory, which proposes that negative cognitions are important for the initiation and maintenance of depression. The general usefulness of induction procedures in research on the depressive syndrome is discussed.

The relation between mood and behavior, long of interest in clinical and social psychology (see, for example, Isen, Shalker, Clark, & Karp, 1978), has recently become of interest in cognitive psychology as well (e.g., Bower, 1981; but see also, Bousfield, 1950). The depressed mood is of particular interest because of widespread reports of associated cognitive deficits. For example, problem solving (Dobson & Dobson, 1981), abstract reasoning (Silberman, Weingartner, & Post, 1983), aspects of memory functioning (Cohen, Weingartner, Smallberg, Pickar, & Murphy, 1982; Stromgren, 1977; Weingartner, Cohen, Murphy, Martello, & Gerdt, 1981; Weingartner, et al., 1982), and the rate of learning (Masters, Barden, & Ford, 1979) and school achievement of some children (Goldstein & Dundon, in press; Goldstein, Paul, & Sanfilippo, 1984) have all been shown to suffer.

There may also be an age related increase in depression across the adult years; an increase of special interest because of the need to distinguish between depression and other medical problems (e.g., Alzheimer's disease) with partially overlapping symptoms (Weingartner, in press).

Within the field of memory, there are two largely independent theoretical frameworks that make predictions about the impact of a depressed mood on performance. The first holds that performance is constrained by the capacity available to handle the demands of concurrent tasks (Kahneman, 1973). Capacity is thought to be influenced by a variety of factors, including mood (Hasher & Zacks, 1979). In particular, capacity may be reduced by depression. From a capacity perspective, depression should have its most visible impact on performance when tasks are extremely difficult because such tasks demand considerable effort. Easy tasks should not be affected by depression because there is usually sufficient capacity for these. Empirical support for this view comes from work with clinically depressed patients (Cohen et al., 1982; Weingartner et al., 1981) and college students whose mood is induced by using the Velten procedure (Ellis, Thomas, & Rodriquez, 1984; Leight & Ellis, 1981). We do not yet know the extent to which performance deficits will be found for the mild variations in mood

that occur naturally in normal young adults. The present research was designed to address this question.

The second theoretical framework argues that mood operates as a schema to organize the processing of incoming information and to guide retrieval of the past (e.g., Beck, 1967; Kuiper, MacDonald, & Derry, 1983; Teasdale, in press). A number of sets of findings are congruent with this view of mood. In one, new information (often a prose passage containing a description of good and bad events that happen to a protagonist) is presented to subjects who typically are induced to be in different moods. Subjects in a depressed mood show preferential recall of negative as compared to positive elements in the passage. Subjects in an elated mood show preferential recall of positive elements (Bower, 1981; Bower, Gilligan, & Monteiro, 1981). In another set of experiments, neutral words are given as cues for the recall of specific personal memories to subjects induced into different moods. Here, too, one sees preferential retrieval of unhappy or unpleasant events by depressed subjects and preferential retrieval of happy or pleasant events by elated subjects (see Teasdale, in press, for a review of this work). Depression also decreases the retrieval latencies of negative life events (Lloyd & Lishman, 1975) and increases the probability of remembering negative self-descriptive adjectives (Kuiper, Derry, & MacDonald, 1982).

Thus, mood seems to influence the ease with which affectively valenced events come to mind (Bousfield, 1950). Several problems remain before this conclusion is widely accepted. First, we do not know the mechanism that underlies accessibility. Bower (1981) has argued that it is the result of the activation of connections among events that were established while a person experienced the same mood. But other recent work suggests that mediating links between memories may be based on comparable arousal levels during the experience of events (Clark, Milberg, & Ross, 1983). Second, we do not know, as Breslow, Kocsis, and Belkin (1981) have pointed out, whether this selectivity is on the encoding or retrieval side of processing, although some recent evidence supports a retrieval bias interpretation (Zuroff, Colussy, & Wielgus, 1983). Finally, we know little about

the extent to which selectivity can be seen for the natural and mild variations in mood that are characteristic of everyday life (see Kuiper, Derry, MacDonald (1982). This is because previous research has been done either with hospitalized depressed people (e.g., Breslow et al., 1981; Clark & Teasdale, 1982) and their controls, or with "normal" subjects whose moods are artificially created by using either hypnotism (e.g., Bower's work, 1981; Natale & Hantas, 1982) or the Velten procedure (e.g., Teasdale & Taylor, 1981). In the latter, subjects read a graded series of self-descriptive statements characteristic of people in the desired mood (Velten, 1968).

Induction procedures create several problems for determining the impact on memory of mild mood swings, among which the most serious are the following: (a) artifically created moods may be more extreme than those commonly seen in everyday life; (b) the subjects used in these studies tend to be highly selected (e.g., the 25% or so of people who are highly hypnotizable); (c) the procedures set the stage for the activation of personal memories that can then subsequently cue the retrieval of mood congruent events (Mathews & Bradley, 1983); (d) the procedures have demand characteristics that, although acknowledged by those who used them, have not necessarily been eliminated (e.g., Buchwald, Strack, & Coyne, 1981; Polivy & Doyle, 1980; Spanos, 1982); and (e) the procedures are open to problems of experimenter bias.

The research reported here was initially directed at three issues concerning the impact of depressed mood on the memory performance of college students: (a) does depression reduce overall performance as a capacity view predicts; (b) is there mood congruent selectivity as schema theory predicts; and if so, (c) is selectivity a product of encoding or retrieval operations (e.g., Alba & Hasher, 1983; Breslow et al., 1981). As will be seen, the answer to the second question precluded asking the third.

All subjects in the three studies reported here were students who had volunteered to participate in a study investigating the "relation between mood and cognition." Mood was assessed by using standard paper and pencil instruments and by having subjects read and, after a retention interval, recall a

story about a person to whom good or happy and bad or sad events had occurred. Across the three studies we found little evidence of mood congruent selectivity effects. We also found little evidence of a mood related disruption of overall performance levels.

Experiment 1

According to cognitive theories of depression (e.g., Beck, 1967; Kovacs & Beck, 1978), depressives have a tendency to attend to and dwell on negative aspects of present and previous experiences. Indeed, negative thoughts are characteristics of currently depressed persons; they also play a role in the onset of depression, as well as in its sustenance once initiated. The cognitive view of depression has had a major impact on research in psychology and psychiatry. Of special importance here is the underlying assumption of much of the research done in this tradition: the degree of depressed mood falls along a continuum from mild to moderate to severe (see Coyne & Gotlib, 1983). Because selectivity has been shown with severely depressed adults (e.g., Breslow et al., 1981), we expected to see some degree of selectivity present among even mildly depressed college students. In particular, we expected to see depressed subjects differentially recall negative story events as compared with positive story events. We also expected that the greater the amount of time between the acquisiton and the retrieval of the information, the greater the extent of differential recall of negative items. This prediction is based on the assumption that if depressed subjects engaged in any extraexperimental rehearsal of the story, their focus would be on the easily accessible negative elements. Nondepressed subjects would not be expected to show such favoritism. To test this, subjects in independent groups recalled the stories they had read at one of three retention intervals.

Method

Subjects. A total of 356 subjects were tested in this experiment (142 men and 214 women).

Design. The design was a $2 \times 3 \times 3$ factorial with Mood State (depressed or not) crossed with Time of Testing (no delay, 30-min delay or 48-hr delay) and Item Type (positive, negative, and neutral). The last factor was within subjects. This basic design was replicated three

times, with three versions of the same story: a strongly positive one, a strongly negative one, and a neutral one.

Materials. A story entitled "A Day in the Life of a College Student" was written in first person singular so that all readers could potentially identify with the protagonist. Each of three versions of the story contained five episodes: morning preparations, the trip to school, three campus events, an afterschool shopping trip, and the commute home. A neutral version of the story was written so as to have approximately equal numbers of good, bad, and neutral events. Positive and negative versions of this template were then created, each having a predominance of positive and negative events, respectively.

In order to identify ideas that subjects would consider extremely positive, extremely negative, and neutral, each story was given to 25 to 27 student volunteers to read. These subjects were asked to rate each idea unit in a story on a 7-point scale on which 1 meant extremely positive and 7 meant extremely negative. Idea units had been initially agreed on for each story by four experimenters. During the rating process, large parts of the story were visible and subjects were not prevented from reading ahead or rereading in order to arrive at their ratings. The mean rating for each idea unit was then determined, and those valued from 1 to 2.4 were called positive, those valued from 2.5 to 5.4 were called neutral, and those valued from 5.5 to 7.0 were called negative. The frequency of each statement type in each of the three versions of the story is shown in Table 1. The neutral story had equal numbers of positive and negative ideas, whereas the positive version had more than twice the number of positive idea units as compared with negative idea units, and the negative version had 3 times the number of negative ideas as compared with positive ideas.

Procedure. Subjects were tested in small groups with a maximum size of 10. Subjects were seated as far as possible from each other to ensure privacy while they filled in the mood inventories. At the beginning of the experimental session, subjects were told that the experiment concerned the relation between mood and memory and to this end they would be asked to fill out two mood inventories, to read a story, and to recall it. Subjects then filled out the Beck Depression Inventory (BDI). This consists of a series of 21 groups of statements, each group referring to a symptom characteristic of depressed people. Within the groups, one statement is neutral with respect to the symptom (e.g., "I do not feel sad"), followed by three to five others that are ordered by increasing severity. Subjects were instructed to choose the statement from each group that best described how they felt "that day." Subjects then filled out the Multiple Affect Adjective Check List (MAACL), which is a list of 132 adjectives pertaining to 3 different states (depression, hostility, and anxiety), 40 of which are scored for depression. They were encouraged to put checks next to those adjectives that described how they felt "at that moment." To protect the privacy of subjects and to limit experimenter bias, the mood inventories were scored after subjects left the experimental setting.

Subjects were next given one of the three versions of the story to read and were asked to try to imagine themselves as the person in that story. Each subject read the story once at his or her own rate. Recall was tested

Table 1
*Number of Positive, Negative, and Neutral
Statements in Each of Three Story Versions*

Statement type	Story version		
	Positive	Negative	Neutral
Positive[a]	26	10	15
Negative	11	30	15
Neutral	26	23	33

[a] Positive statements were rated from 1.0 to 2.4 on a 7-point scale; neutral statements were rated from 2.5 to 5.4; negative statements were rated from 5.5 to 7.0.

at one of three retention intervals: immediately after finishing the story, 30 min later, or 48 hr later. Subjects were fully informed about the existence of a recall test, but they did not know their particular retention interval condition before they began the experiment. Subjects whose recall was tested after a 48-hr interval were dismissed after reading the story. Subjects tested after 30 min filled the first 15 min of that time rating the truth of each of a series of statements. They spent the next 15 min solving 21 riddles.

For the memory test, all subjects were given two blank pages and were asked to recall the entire story as well as they could. Because of recent concern about the stability of mood over durations comparable to our 48-hr retention interval (see Hammen, 1980; Hatzenbuehler, Parpal, & Mathews, 1983; Lewinsohn & Teri, 1982), subjects in that condition were given the BDI again just prior to recall. The recent concerns stem from the fact that despite the BDI's reasonably high (in the .70s) test retest reliability, a sizeable proportion of subjects termed depressed on one session will not be classified so on a later one (e.g., Hatzenbuehler et al., 1983). To handle this problem, we compared the recall patterns of those 48-hr retention subjects who were depressed on both occasions with those who were categorized as depressed only on the initial test. The criteria for depression are categories a, b, and c, described subsequently. Because we found no difference in performance between the two subgroups of subjects, analyses involving the 48-hr retention condition are based on depression as defined by performance on the initial test only.

Results

Recall protocols were scored for gist production of idea units by raters who were blind with respect to the mood of individual subjects. This procedure was adopted to minimize experimenter bias. They were not blind to the particular story version a subject saw. Two raters were trained by having them individually score the protocols from 10 subjects. The discrepancies between the two were very few and were easily resolved. Given the high agreement, raters then independently scored the remaining protocols. Two different

dependent variables were derived: (a) the proportion of items recalled from the positive, negative, and neutral idea unit categories; and (b) the proportion of a subject's total recall of affectively valenced items (positive and negative idea units only) that were positive. The latter was the measure used by Bower et al. (1981). The Bower measure does offer the opportunity to look at recall of extremely affectively divergent items only. We report the former measure; no conclusions about the mood variable are changed by using the latter.

Across all subjects, the mean scores on the BDI and the MAACL were 6.96 and 14.06, respectively. The median scores were 6 and 14, respectively. The correlation between the two inventories was modest but significant, $r = .467$, $p < .005$. Our BDI means are similar to those reported elsewhere for college students (e.g., Hammen & Padesky, 1977; King & Buchwald, 1982) as are our MAACL means (Zuckerman & Lubin, 1965). When used as a psychiatric tool, scores on the BDI from 10 to 15 are suggestive of mild depression, scores from 16 to 23 indicate moderate depression, and the more extreme scores indicate severe depression (Bumberry, Oliver, & McClure, 1978; Hatzenbuehler et al., 1983). The proportion of subjects falling into each category were .18, .06, and .02, respectively.

Creating definitive subgroups of depressed and nondepressed subjects is difficult for two reasons. First, the measures of depression are not perfectly correlated with one another. Second, different researchers have used a number of different criteria. In the absence of definitional consensus, we adopted the conservative strategy of dividing subjects into depressed and nondepressed subgroups by using the following criteria (each of which has been used in the literature): (a) the sample median on the BDI (6 and above are considered depressed); (b) the more widely used BDI of 9 and above as the criterion for depression, a definition we will term *standard* (e.g., Alloy & Abramson, 1979; Goodwin & Williams, 1982; Kuiper & Derry, 1982; Miller & Seligman, 1973); (c) the sample extreme quarters on the BDI (10 and above is depressed, 3 and below is nondepressed); (d) the standard score for depression on the

Table 2

Frequency Distribution of Subjects in Mood Categories for Each of Eight Different Criteria

Criterion	Mood	Experiment 1	Experiment 2 Intentional	Experiment 2 Incidental
BDI median	Nondepressed	175	26	28
	Depressed	181	27	28
BDI standard	Nondepressed	247	36	41
	Depressed	109	17	15
BDI extreme	Nondepressed	112	14	22
	Depressed	94	17	15
MAACL median	Nondepressed	173	15	22
	Depressed	175	32	34
MAACL extreme	Nondepressed	100	11	17
	Depressed	91	18	15
SCL 90 R standard	Nondepressed		21	28
	Depressed		31	28
SCL 90 R extreme	Nondepressed		13	17
	Depressed		17	12
All tests[a]	Nondepressed	150	8	8
	Depressed	76	15	10

Note. BDI = Beck Depression Inventory; MAACL = Multiple Affect Adjective Check List; SCL = Symptom Check List.

[a] For Experiment 1, these are subjects selected for performance on the BDI and the MAACL. For Experiment 2, these are subjects selected for performance on all three tests.

MAACL (14 and above is depressed); (e) the sample extreme quarters on the MAACL (19 and above is depressed; 9 and below is nondepressed); and (f) the standard definitions on both the MAACL (14 and above is depressed) and the BDI (9 and above is depressed). The frequency distribution of subjects into categories may be seen in Table 2. Of course, some of these divisions of subjects produced cell sizes involving the time of testing variable that were quite small (*n*s of 6 or less). In these instances the critical Mood × Item Type × Time of Testing interaction could not be assessed. We were always able to test for the Mood × Item Type interaction.

The data from each of the three story versions were then analyzed for each of the six definitions of depressed and nondepressed subjects by using a 2 × 3 × 3 (Mood × Time of Test × Item Type) mixed analysis of variance (ANOVA). In this and the two succeeding experiments, both weighted and unweighted ANOVA solutions were used to handle the unequal cell sizes. The outcomes were virtually identical, and the text reports values from the unweighted means solution. Because of the large number of tests conducted, and

because we anticipated finding mood effects, the alpha level was set at .01. No conclusions are altered, however, if the more lenient criterion of .05 is used. For illustrative purposes, we show recall scores for each of the three story versions on one particular mood grouping of subjects, the median split on the BDI (see Table 3).

Across all divisions of subjects and all story types two effects were always reliable: time of testing and item type. The time effect reflects the fact that forgetting occurred across the 48-hr retention interval. The item type effect, although always present, took slightly different shapes across the three story versions. For the neutral and negative stories, the negative items had a reliable advantage in recall as compared with both neutral and positive items, whose recall was equivalent. For the positive story, both positive items and negative items were approximately equally well recalled with both being better recalled than neutral items. The item type effects reflect a combination of particular items, the story in which they were embedded, their sequential position in that story, and their connections with other story items. As a result, main effects involving item types are not especially interesting.

Table 3

Proportion of Positive, Negative, and Neutral Items Recalled From Each Story Version by Depressed and Nondepressed Subjects Defined by the Median Split on the BDI

Mood	n	BDI	Item type			M
			Positive	Negative	Neutral	
			Positive			
Nondepressed	42	3.07	.44	.47	.31	.41
Depressed	57	12.23	.38	.40	.29	.39
M	99	8.34	.40	.43	.30	
			Negative			
Nondepressed	69	2.61	.31	.44	.31	.35
Depressed	63	10.79	.28	.46	.30	.35
M	132	6.51	.30	.45	.30	
			Neutral			
Nondepressed	64	2.33	.40	.52	.40	.44
Depressed	61	10.59	.42	.54	.41	.46
M	125	6.36	.41	.53	.40	

Note. Depressed subjects scored 6 and above.

The critical schema-theory questions in the experiment are addressed by two interactions: Mood × Item Type × Time and Mood × Item Type. The higher order interaction can be discussed quickly; small cell sizes prevented a sensitive test of this effect in several places, but it was not significant for any of the three story versions at either the .01 or the .05 level. So we turn to the lower level of interaction, that between mood and item type. None of the 18 tests were significant at the strict criterion. The most common pattern may be seen in Table 3, where the largest F value, $F(2, 252) = 1.28$, was obtained for the negative story.

At the more lenient criterion of $p < .025$, 3 of the 18 tests of the Mood × Item Type interaction were significant. All three involved the MAACL criteria of depression with subjects who received the positive version of the story. For the standard MAACL criterion, in which scores of 14 and above are considered depressed, the Mood × Item Type interaction was reliable, $F(2, 184) = 4.05$. The nondepressed subjects recalled 39% of positive items, 45% of negative items, and 27% of neutral items. Depressed subjects recalled 41% of both the positive and negative items and 32% of neutral ones. The pattern of this interaction was the same for the other two cases in which it was found. And it certainly is not the one expected on the basis of previous research; here it is nondepressed subjects who show a greater tendency toward selectivity (at least of negative items as compared with neutral items) than depressed subjects. Thus even at a lenient criterion, there is no evidence in this experiment of depressed subjects favoring the recall of negative items. Finally, no further effects are significant at the .05 level.

Nowhere in this entire set of data is there evidence of superior overall performance on the part of nondepressed subjects. Not one of the 18 tests ever showed a difference in total recall between depressed and nondepressed subjects that reached significance at even the .05 level. The mild levels of depression seen here do not seem to be substantial enough to disrupt performance on a prose memory task. Alternatively, it is possible that mildly depressed subjects can exert special effort to do well on a task. This might have been possible here because subjects knew about the forthcoming test at the time they read the story.

Discussion

Our attempt to demonstrate that mood influences memory was not successful when

we compared mildly depressed college students with nondepressed college students. Mood does not seem to be a potent variable in determining either what is included in recall or in determining how much is recalled. The lack of differences in the content of recall stands in marked contrast to the findings of Bower et al. (1981) who used hypnotized subjects. Apart from factors associated with hypnotism, one aspect of potential relevance to the difference between the Bower et al. findings and our own is that recall was incidental in their work and intentional in ours. Elsewhere in the prose memory literature, there is evidence that the pattern of recall can be markedly influenced by the cover instructions given to subjects at the time they read or hear a story (e.g., Spiro, 1980). Thus in a second experiment, intention to recall was varied between groups of subjects.

In this experiment we used a story, taken from Bower et al. (1981, Experiment 3), whose protagonist experienced good, bad, and neutral events in his life. The subjects were college students whose mood was assessed by using three (instead of two) standard paper and pencil procedures. This time only one retention interval was used, which lasted 20 min. This was chosen because it was the one used by Bower et al. The design now comprised two of the original factors, mood and item type, crossed with a third factor, knowledge of the forthcoming memory test; intentional or incidental. The incidental portion of this study enabled a partial replication of Bower et al's Experiment 3.

Experiment 2

Method

Insofar as possible, and excluding the hypnosis procedure, the methods used here followed closely those used by Bower et al. in their Experiment 3. Subjects volunteered for a study about the relation between mood and cognition. They were tested in small groups in which they first rated how they felt at that moment on a 7-point scale from *extremely sad* (1) to *extremely happy* (7). (The data from the self rating scale were not analyzed because unlike the other three measures used here, there is no information available on the reliability and validity of the measure. It was included only to ensure that our procedure was as close as possible to that used by Bower et al.) Then they rated themselves on the BDI for how they felt that day. Subjects were given Bower et al.'s "Paul Smith" story to read for 5 min. Subjects in the intentional

condition were told they would be asked to recall the story. Following Bower et al's procedure, subjects in the incidental condition were told only that they would be asked some questions about the story. Subjects were given no special instructions about identifying with the protagonist. In the 20-min interval between reading the story and the recall test, subjects filled out, in order, two additional standardized paper and pencil measures of mood, the MAACL and the symptom check list 90 R (SCL 90 R) (Derogatis, Lipman, & Kovi, 1973). The SCL 90 R test consists of a series of 90 symptoms (e.g., feeling everything is an effort, feeling of being caught or trapped), 13 of which pertain to depression. There are eight other dimensions assessed as well, including for example interpersonal sensitivity and anxiety. For each symptom statement, subjects estimated how distressed they were on a 5-point scale.

In the remaining time, subjects worked at their own pace on a series of three filler tasks taken from the Kit of Factor-Referenced Cognitive Tests (Ekstrom, French, Harman, & Dermen, 1976). In order, subjects solved word meaning puzzles, detected patterns in dot arrays, and detected an object or word present in a series of degraded images. At the end of the 20-min interval, subjects were asked to write down everything they could remember about the story they had read "including all details . . . no matter how trivial they seemed." Ten minutes were allowed for recall. Afterwards, subjects rated their momentary feelings from sad to happy on the original 7-point scale.

The story used here, as the one used in Experiment 1, depicted sad, happy, and neutral events. In this story, the events were embedded in a description of childhood memories elicited during a series of psychiatric sessions in which hypnotic age regression was used. There were 26 idea units in each of three categories: positive, negative, and neutral.

A total of 109 subjects participated, and all were undergraduate volunteers. There were 48 men and 61 women.

Results and Discussion

Across all subjects the mean scores on the BDI and the MAACL were 6.88 and 16.04, respectively. The proportions falling into the mild, moderate, and severe categories on the BDI were .18, .03, and .04, respectively. Because the SCL 90 R was originally normed separately for men and women, we report the means of each, .80 and 1.17, respectively. The values for all three tests are comparable with those reported elsewhere. Because the normative sample for the SCL 90 R found different distributions of scores for men and women (as we found here, $p < .002$), we compared BDI and MAACL scores for these two groups. As for other samples (Hammen & Padesky, 1977; King & Buchwald, 1982), the men and women tested here did not differ

Table 4

Number of Happy, Sad, and Neutral Items Recalled by Depressed and Nondepressed Subjects Defined by the Median Split on the BDI

	Instructional conditions									
	Incidental					**Intentional**				
Mood	*n*	BDI	Happy	Sad	Neutral	*n*	BDI	Happy	Sad	Neutral
Nondepressed	28	2.04	6.00	6.39	4.82	26	3.04	7.04	6.81	5.96
Depressed	28	10.64	5.71	5.79	5.46	27	11.70	6.56	6.85	6.41

Note. Depressed subjects scored 6 and above.

on the BDI (means of 6.19 and 7.43, respectively, $t(107) = 1.10$) nor on the MAACL (means of 15.02 and 16.84, respectively, $t(107) = 1.44$.

As in the first experiment, there was a reliable if modest correlation between the BDI and the MAACL, $r = .457$. The BDI and the SCL 90 R were also reliably correlated, $r = .679$, as were the MAACL and the SCL 90 R, $r = .373$.

Recall was scored for the presence of idea units based on preserving the gist of the original material by raters who had no knowledge of the mood scores of subjects. Subjects were divided into eight mood groups on the basis of performance on the three standardized tests used here. The groups are as follows: (a) the sample median score on the BDI (here, 6); (b) the standard experimental definition of depression on the BDI (with 9 and above being depressed); (c) sample extreme quarters on the BDI (9 and above is depressed, 3 and below is nondepressed); (d) the standard definition of depression on the MAACL (14 and above is depressed); (e) the sample extreme quarters on the MAACL (depressed is 20 and above, nondepressed is 11 and below); (f) the normative median score on the SCL 90 R (separately for men, for whom .62 and above is depressed, and women, for whom 1.08 and above is depressed); (g) the sample extreme quarters on the SCL 90 R (for men, 1.15; for women, 1.54); and (h) critical scores on all three tests (here, subjects who meet criteria b, d, and f are considered depressed or not depressed). A frequency distribution of subjects in each category is seen in Table 2.

The data are fairly straightforward; the outcome of the eight statistical tests of the

$2 \times 2 \times 2$ mixed ANOVAs was that no effects involving an interaction with mood were significant. This was so even in the incidentally instructed conditions. Table 4 shows mean recall for subjects divided on the basis of their median score on the BDI. For these data, the interaction among mood, intention, and item type was not reliable, $F < 1$, nor was the interaction between mood and item type, $F(2, 201) = 2.53$, $p = .08$. As in Experiment 1, there is a slight suggestion of nondepressed subjects showing a larger difference in recall between neutral and sad items than do depressed subjects. We thus failed to find any evidence of mood functioning as a selective filter, a filter that allows congruent information greater access to (or egress from) memory than incongruent information.

In agreement with the findings of Experiment 1, mood had no overall effect on performance for the data in Table 4, $F < 1$. The mild downward deflections of mood experienced by college students seem not sufficient to disrupt their ability to perform in a prose recall task.

Two other variables influenced performance: intention and item type. Intention influenced recall in five of the eight comparisons. In all five cases, intention boosted recall, creating an average 3 item advantage compared to incidentally instructed subjects, $F(1, 101) = 8.11$, $p < .005$. Item types differed in their recall probability in seven of the eight comparisons, $F(2, 202) = 3.04$, $p < .05$. In all cases, happy and sad items had an advantage in recall over neutral items.

There is no suggestion in these data that we would have seen selectivity in Experiment 1 had we, following Bower et al., used incidental memory instructions. Indeed, we note

that Breslow et al. (1981) showed selectivity effects for clinically depressed subjects by using intentional memory instructions.

Experiment 3

At least one aspect of these experiments might be responsible for our failure to observe selectivity in recall; subjects' "self-schemas" may not have been activated. It has been argued that schema-congruent memory effects will only be seen when the self-schema is activated (Clark et al., 1983; Kuiper et al., 1982). This view comes largely from a series of studies in which subjects were asked to rate adjectives for a variety of features including structural and semantic ones as well as for whether or not they refer to the subject her or himself. Recall was best for words checked as referring to one's self, and for clinically depressed patients, there was a profound selectivity; negative adjectives were far better recalled than positive ones (Kuiper et al., 1982). Such selectivity is not seen when adjectives were rated for structural or semantic features.

In Experiment 1 we had tried to encourage subjects to identify with the protagonist of our stories. The stories included the kinds of problems that university students ordinarily encounter. The stories were written in first person singular and the episodes and events were chosen to be gender-neutral. Finally, the instructions were quite explicit in asking subjects to imagine themselves in the position of the protagonist. Nonetheless, we thought it potentially worthwhile to attempt a partial replication of Experiment 1 in which we tried to increase the likelihood that subjects identified with the protagonist.

Method

The procedure was identical in most respects to the immediate recall condition of Experiment 1 except for instructions concerning identifying with the protagonist. For one group, called identify, each subject was told to imagine her or himself as the person in the story, living through the very day described in the passage. In the control group, subjects were simply asked to read the story. After recall was completed, subjects rated themselves on a 7-point scale for the degree to which they had identified with the protagonist. Only the negative version of the story was used.

A total of 113 subjects participated, 61 women and 52 men. There were 55 subjects in the identify group, and 58 in the control group.

Results

Across all subjects, the mean scores on the BDI and the MAACL were 8.03 and 15.24, respectively. The correlation between the two tests was again reliable, $r = .516$. The proportion of subjects falling into the mild, moderate, and severe depression categories on the basis of the BDI were .27, .06, and .02, respectively.

Six criteria for depression were used: (a) the sample BDI median of 7 or above was considered depressed and 6 or below nondepressed; (b) the standard score of 9 and above on the BDI; (c) the sample extreme quarters on the BDI (3 and less was nondepressed, 11 and above was depressed); (d) the standard MAACL score of 14 and above was considered depressed and 13 and below, nondepressed; (e) the sample extreme quarters on the MAACL (10 and below was nondepressed, 20 and above was depressed); and (f) the standard scores on the BDI and the MAACL.

Recall was scored, as before, for gist. Recall scores for groups defined by the BDI median criterion are shown in Table 5. The same pattern of findings was seen for groups defined by the other criteria, and so only the former criterion will be discussed in detail. As for the negative story in Experiment 1, there were dramatic differences in the recall of the three different item types, $F(2, 218) = 84.75$, $p < .001$. A greater proportion of negative items (.49) were recalled than were positive items (.39), and more of these were recalled than were neutral items (.29). Again, as in our previous studies, the Mood × Item Type effect was not significant, $F < 1$. The contrast of strong instructions to identify with the protagonist with no particular instructions to do so did not alter this interaction, $F(2, 218) = .54$.

One surprising effect was significant here for the first time, and that is the contrast between the two mood groups $F(1, 109) = 4.76$, $p < .03$. In disagreement with capacity models, depressed subjects recalled slightly more of the passage (42%) than did nondepressed subjects (36%). This pattern appeared two other times in this experiment, in each case with depressed subjects recalling slightly more than nondepressed subjects. Nowhere else in this series of experiments (including

Table 5

Proportion of Positive, Negative, and Neutral Items Recalled by Depressed and Nondepressed Subjects in the Identify and Control Conditions

Mood	n	BDI	Positive	Negative	Neutral	M
Identify						
Nondepressed	26	2.96	.35	.47	.27	.36
Depressed	29	12.17	.40	.49	.29	.39
M		7.82	.38	.48	.28	
Control						
Nondepressed	26	3.46	.36	.46	.26	.36
Depressed	32	12.09	.43	.55	.34	.44
M		8.22	.40	.51	.30	

Note. Depressed subjects scored 7 and above.

Experiment 1 when this story version was also used) did we find this result, and we consider this a curious and perhaps even spurious finding.

Not surprisingly, subjects in the identify condition indicated a higher degree of identification with the protagonist (5.27) than did subjects in the control condition (4.05). There was no evidence that mood made a difference in the degree to which subjects reported they could identify. Nor was there any evidence that identification altered recall patterns.

Discussion

This experiment considered a methodological factor that was potentially responsible for our failure to find mood-dependent selectivity effects in the two previous experiments; subjects in those two experiments did not activate a self-schema. Here we contrasted the performance of subjects given strong instructions urging them to imagine themselves to be the person in the story, to the performance of subjects given no identification instructions at all. We still failed to find differential selectivity effects for depressed and nondepressed subjects.

Several explanations of our findings are possible: (a) the self-schema is difficult to activate experimentally; and (b) if activated, it is not a potent determinant of performance for college students. In fact, Kuiper et al. (1982) have recently argued that the self-schemata of mildy depressed people may have both positive and negative aspects to them and they may not be as well organized as are the self-schemata of severely depressed

people (see also Davis & Unruh, 1981; Ruehlman, West, & Pasahow, 1984; Zuroff, 1980). According to this view, one would expect to see selectivity only in severe cases of depression (see Breslow et al., 1981) where the self-schema contains a preponderance of negative elements.

General Discussion

The temporary mood state of depression among college students seems not to be a potent individual difference variable. Natural variations in depression did not influence either the overall amount recalled or the particular affective content of what was recalled: young adults in neutral and depressed moods recalled the same distribution of positive, negative, and neutral evaluative items from stories describing the life of an individual person.

This is not to say that mood variations are trivial subjective states with no implications for overall efficiency of cognitive functioning. That overall efficiency is reduced in depression seems clear from clinical observations. Depressed patients report a variety of cognitive symptoms, including difficulty in working on problems that were once routine.[1] Research with hospitalized depressed patients confirms these observations. Depressed adults who do well on easy, low demand tasks begin to show performance decrements as demands

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[1] It is of course possible that there is no relation between complaints and actual performance. Some recent data with elderly adults supports this contention (Popkin, Gallagher, Thompson, & Moore, 1982).

rise (Weingartner et al., 1981). For example, hospitalized depressives do as well as controls when their task is to recall items from relatively structured lists of words (e.g., related words, or words clustered by category membership). Recall performance deteriorates relative to that of controls when structure is either absent (only unrelated words are listed) or not obvious (as when category instances are arranged in a random series; see Weingartner et al., 1981, Experiments 1 and 3). As well, subjects whose depressed moods are induced show performance deficits on a very difficult task requiring the acquisition of six letter nonsense words (Leight & Ellis, 1981).

Why then did we fail to find evidence of overall performance decrements? One possibility is that the prose memory task we used was relatively simple and undemanding. After all, the stories were interesting and logically structured. Of course, it may be that mild mood flutuations in otherwise normal people leave them with capacity sufficient to handle the present task. Either or both of these reasons could account for our failure to find support for the effort/capacity model of cognitive functioning under depression (Cohen et al., 1982; Hasher & Zacks, 1979; Weingartner et al., 1981; see also Ellis et al., 1984). If the model is correct, the use of more demanding tasks (e.g., ones with multiple simultaneous components) should begin to reveal a breakdown in the overall performance of mildly depressed subjects.

We turn now to an evaluation of the issue of selectivity. Mood has been presumed to function as a schema: a filtering device that favors the processing of information congruent with the current state. Evidence for this comes from research with clinically depressed patients showing mood congruent retrieval patterns for newly acquired information (Breslow et al., 1981) as well as for past autobiographical memories (Clark & Teasdale, 1982). Similar selectivity effects have been reported for normal subjects induced to be depressed or elated (Bower et al., 1981; Teasdale & Taylor, 1981). As well, there is evidence that what might be thought of as a natural mood induction procedure (reading brief newspaperlike descriptions of bad versus neutral events) changes subjects' judgments of the risk of negative life events (Johnson & Tversky, 1983). In particular, a negative story, in comparison with a neutral one, increased subjects' estimates of the absolute level of risk associated with all sources of morbidity, not just those logically related to the one discussed the news story. Because selectivity has been widely reported elsewhere, what are we to make of the present findings?

Three nettlesome issues need to be considered in evaluating our data and comparing them with those of other investigators. The first issue has to do with the validity of data from studies using induction to create moods. The second is whether depression can be ordered along a continuum from mild to moderate to severe. The third and major issue centers on schema theory itself and on current cognitive models of depression that are based in part on schema theoretic notions.

We begin with the question of why other researchers using nonclinically depressed adults as subjects may have shown selectivity effects. A reconsideration of the subjects in those other studies may be illuminating. Bower's research (1981; Bower et al., 1981) was conducted with subjects selected via a screening procedure for hypnotic susceptibility. Depending on the test used, anywhere from 15% to 45% of adults are termed highly susceptible (e.g., Radtke & Spanos, 1981; St. Jean & Coe, 1981). What differentiates such people from others? Probably most important is that highly hypnotizable people are also highly suggestible (Spanos, 1982), and highly suggestible people may be extremely sensitive to the presence of subtle demand characteristics in the experimental environment.

At least some of Teasdale's research using the Velten induction procedure was also conducted on a selected portion of nonclinically depressed adults, in his case, women. In two studies (Teasdale & Fogarty, 1979; Teasdale & Taylor, 1981), the initial selectivity was further increased by using data from only those subjects who showed extreme mood change effects as a result of the induction procedure. This amounted to 54% of the original group of only female subjects.[2] Other

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[2] In one study, 30 subjects were sampled to get 16 whose data were analyzed. (Teasdale & Fogarty, 1979). They report here that the outcome of the experiment was identical for the smaller and larger samples. Elsewhere (e.g., Teasdale & Taylor, 1981) this information is not provided.

investigators using the Velten procedure have used only women (e.g., Alloy, Abramson, & Viscusi, 1981; Snyder & White, 1982). The rationale for this is typically not presented directly, although there are suggestions (Alloy et al., 1981, footnote a; Natale & Hantas, 1982) that women are more susceptible to induction techniques than are men. As in the Bower work using hypnotism, we may have conclusions based on data from selected samples of subjects who may well be highly suggestible.[3]

Whatever other criticisms might be leveled against induction studies (e.g., demand characteristics and vulnerability to experimenter bias; see Spanos, 1982, for a criticism of hypnotism and Buchwald et al., 1981, and Polivy & Doyle, 1980, for criticisms of the Velten procedure), many of these studies have a tradition of sampling from a selected group of normal mood subjects. The three studies reported here used a less selective sample of college students and so provide us with a broader base from which to generalize to young, educated, and not particularly depressed adults.

An alternative interpretation of selectivity effects produced with the Velten procedure is based on the fact that statements used during the induction phase itself may activate specific memories (Mathews & Bradley, 1983) that, whether or not they enter awareness at that time, will still be available to influence subsequent performance, (Eich, 1984; Jacoby & Dallas, 1981; Marcel, 1983). In particular, the availability of negative versus positive memories or thoughts can then serve to constrain the interpretation placed on any subsequently encountered information. As well, these now more easily available thoughts will be more accessible at a test of recall.

This is not to say that experiments using induction procedures can tell us nothing useful about depression. Indeed, to judge solely from performance similarities between mood-induced subjects and depressed patients, susceptible subjects may well be good analogue models of clinical depression (cf. Levitt & Chapman, 1979). It might be the case that induction procedures create moods that are more extreme than are ordinarily seen in natural, nonclinically depressed subject groups, enabling induced subjects to behave like naturally depressed ones. The question

that we consider next is whether a broader sample of college students can serve as an analogue of depression.

In much of the experimental work on depression, college students with sufficiently high scores (often 9 and above) on the BDI are used to investigate the consequences of depression. Clinical psychologists have raised a number of objections to the rationale that underlies this use of college students (see, for example, Depue & Monroe, 1978). One objection is to the assumption of the existence of a continuum of depression. Many have pointed out that depression is a syndrome, or even a set of syndromes, which has dysphoric mood as just one component among many. Mood is possibly the single factor that is widely thought to be continuous between profound and mild cases of depression among adults (see Coyne & Gotlib, 1983, for a review of these issues; see also Depue & Monroe, 1978; Kuiper et al., 1982; Weissman & Klerman, 1977).

Such considerations raise problems with the assumption that what is seen of cognitive functioning with clinically depressed patients will necessarily be seen for mildly depressed college students, albeit to a lesser degree. Whether or not one sees continuities in behavior will depend on what it is that is mediating the performance of clinical depressives. If it is dysphoric mood, one would expect parallels. If it is some other aspect of depression, one would not. The question here is what should we expect?

Both Teasdale (in press) and Bower (1981) explicitly tie selectivity effects to *mood*. Having here identified subjects who differ in the degree of momentary dysphoria (as measured at least by the BDI; see Depue & Monroe, 1978), we can reasonably expect to see some parallels to the behavior of profoundly dysphoric subjects. Of course we did not see any parallels in our three attempts. This raises the question of whether one can use college students as subjects to study depression even when (as for mood) the aspect of depression that one is interested in is shared with clinical depressives. Such a statement implies that a good deal of the existing research on depres-

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[3] Our own data were reanalyzed to determine if the use of female subjects would have changed our findings about mood and memory. It would not have.

sion that uses noninduced college students may tell us little about the clinical syndrome of depression. Of course, one study, or even three, is an insufficient basis from which to draw such a strong conclusion. Nonetheless, the question of the use of college students as analogues of profound depression remains an open one (see Depue & Monroe, 1978, pp. 14–18, for an excellent discussion of this general issue).

The final issue we consider is the validity of the schema view itself, at least when applied to people in mildly depressed mood states. Cognitive theories of depression (Beck, 1967; Kovacs & Beck, 1978; Teasdale, in press) propose that negative cognitions of the self, world, and future are of fundamental importance in both initiating and maintaining profound depression. It is Beck's proposal that maladaptive schemata exist in memory and, once activated, will heavily influence what of a new experience is stored in memory as well as what selection of past experiences enters the current thought stream. In addition, the maladaptive schema may distort ongoing processing so as to create conclusions consistent with the schema (Kovacs & Beck, 1978). Thus people predisposed to depression (among whom many will test as mildly depressed on paper and pencil inventories) are thought to have a different orientation toward evaluative information than people not so predisposed. With respect to stories such as ours, depressed and potentially depressed people would be expected to show a greater tendency to recall more of the negative aspects than would nondepressed subjects (see Breslow et al., 1981). We found no evidence of any such tendency for college students in a mildly depressed mood compared to their nondepressed peers.

Our data are not easily accommodated by Beck's view. Nor are the data of other investigators who have failed to find sadness function as a selective filter that increases the probability of recalling negative events as compared with neutral or positive events (for example, see Isen et al., 1978, Experiment 2; Nasby & Yando, 1982; Natale & Hantas, 1982).[4] Such findings are troublesome to schema theories because they typically assume (see Alba & Hasher, 1983) that the target information is selected for encoding on the basis of congruence with the schema, in this instance with the mood of a person.

In the present research, we were unable to detect a differential disposition to recall negative events by mildly depressed college students. Among a sample of mildly depressed subjects, there should be some people with negative schemata that are currently activated; schemata that may eventually propel them to become more seriously depressed. The absence of evidence of selectivity in mildly depressed adults (see also Kuiper & Derry, 1982), raises problems for schema theories that assume that negative thought patterns are antecedents of depression (see also Coyne & Gotlib, 1983; Lewinsohn, Steinmetz, Larson, & Franklin, 1981). It should be clear that our data in no way undermine the validity or usefulness of schema theories for describing the memory processes of severely depressed people.

In summary, there is little evidence in the present data for either the capacity view of the operation of mood or the cognitive-schematic view. Mild variations in mood seem not to have a profound impact on the recall performance of college students.

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[4] Isen et al. (1978) propose that good mood functions as a retrieval cue to facilitate the recall of positive events. Bad moods show a more complex pattern of cuing effects (e.g., they reduce recall of positive material but do not facilitate recall of negative material) because normal people are strongly motivated to work hard to counteract the tendency to recall negative events.

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