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Remembering With and Without Awareness in a Depressed Mood: Evidence of Deficits in Initiative

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We propose that depressive deficits in remembering are revealed in tasks that allow the spontaneous use of strategies; tasks that bypass or direct the use of strategies should not produce depressive deficits. College students received depressive- or neutral-mood inductions after answering questions worded to reflect homophones' less common meaning. After the inductions, subjects spelled old and new homophones and showed no effect of the depressive inductions on unaware memory for the old homophones. Subsequent tests of recognition did, however, reveal differences according to the induced mood or the presence of naturally occurring depression (in Experiment 3). The differences, evidence of nondepressed subjects' use of strategies, tended to disappear when all subjects were provided with strategies for spelling or recognition. The results indicate that depressives experience deficits in cognitive initiative. We review the literature on depressive memory from this perspective.

Problems with memory are typical of depression, so much so that they are included among diagnostic criteria for depression (see Spitzer, Endicott, & Robins, 1978). Yet a review of the literature on depressed people's performance in memory tasks does not reveal consistent findings for depressive deficits. How can this inconsistency be understood? We propose that depression inhibits cognitive initiative. Depressed persons do not spontaneously use strategies or engage in the types of elaborative thinking that produce good performance in typical memory tasks, but they are capable of doing so when they are directed.

We identify three categories of conditions for the use of strategies that benefit performance in memory tasks: spontaneous, directed, or bypassed. The *spontaneous* use of strategies occurs when processing is not well controlled by the design of the task. It happens when subjects organize without direction, for example, or when they notice relations to extratask knowledge, or when they simply continue to rehearse when they are not required to do. According to our account of depressive deficits, deficits will occur when subjects can spontaneously elect strategies that are not specified in the task. *Directing* the use of strategies can raise the performance of the depressed subjects, as well as the performance of the nondepressed subjects who do not spontaneously elect them, to comparable levels. *Bypassing* the use of strategies in tasks that benefit from their use (by concealing the nature of the task, for example) can lower the performance of depressed and nondepressed subjects to comparable levels by affecting the nondepressed subjects more than the depressed subjects.

We think that this account pertains to a number of findings on deficits from natural and induced depression. Selected examples of research on deficits produced by mood inductions and deficits observed in naturally depressed individuals are reviewed in the general discussion. At this point, however, to clarify our notion of the role of initiative in depressive memory, we compare the initiative account with the resource-allocation hypothesis (see Ellis & Ashbrook, 1988; Hasher & Zacks, 1979).

A number of researchers have proposed that deficits in remembering are due to a reduction in cognitive capacity in college students who experience mood induction (e.g., Ellis, Thomas, & Rodriguez, 1984), in college students who report depression (e.g., Hasher & Zacks, 1979), and in patients who experience minor or major depression (e.g., Roy-Byrne, Weingartner, Bierer, Thompson, & Post, 1986). This view is derived from the assumption that there is a limit on the amount of resources available for performing mental operations (e.g., James, 1890; Kahneman, 1973) and holds that depression either occupies or reduces those available resources (e.g., Beck, 1967). Furthermore, characteristics of events vary according to the amount of resources that they typically demand during processing. Hasher and Zacks, for example, proposed that both spatiotemporal and overlearned information typically are processed automatically, which places little or no demand on available resources, but that the use of such learning strategies as organization, elaboration, and mnemonic devices demands effortful processing. Tasks that involve such strategies, in contrast to more automatic processes, typically produce superior performance on subsequent tests of remembering (see Craik & Jacoby, 1979). Hence depressed individuals show decrements in remembering the materials from effortful

Experiment 1 was conducted by Tammy S. Hardin in partial fulfillment of requirements for University Honors at Trinity University. Leslie Heinberg conducted Experiment 3 for her Senior Thesis. Alada Caughey and Jay Newberry served as experimenters in Experiments 2 and 3. Portions of the research were described at the meeting of the Psychonomic Society in Seattle, November 1987.

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processing tasks, as a result of their reduced capacity to perform such operations, but do not show decrements in remembering materials from tasks that depend on more automatic processes. They fail to show the memorial benefit of effortful processing that is obtained with nondepressed subjects (see Tyler, Hertel, McCallum, & Ellis, 1979).

A critical issue, then, is whether depression limits the *ability* to use effortful operations or whether, instead, it reduces the *initiative* to use beneficial strategies when their use is not demanded by the task. The view just described implies that depressed individuals lack the ability to process effortfully because resources are allocated to "depressive schemata" or because resources are limited in some other fashion (such as altered functions of biogenic amines; Baldessarini, 1981; Henry, Weingartner, & Murphy, 1973). If depressed subjects *can* allocate resources and perform as well as nondepressed subjects on effortful but well-structured tasks, then the utility of a focus on cognitive effort should be limited to the stage of initiating such effortful processing.

Our focus on initiative highlights variations in the constraints imposed by cognitive tasks. Tasks vary in the degree to which they constrain the type and amount of processing, in such a way that uninstructed strategies may be elected spontaneously in some tasks and reduced or prevented by the constraints of other tasks. Nondepressed subjects frequently go beyond the requirements of loosely constrained tasks, but depressed subjects may fail to initiate similar operations that are not required. Whether a depressive impairment in initiative is strictly motivational in nature (see Abramson, Metalsky, & Alloy, 1989) or involves metacognitive deficits is a topic for further research. Our concern is simply to delineate the phenomenon and relate it to previous research on depression and memory.

Our emphasis in this report is placed on varying the degree of initiative that is induced by retrieval tasks (see Hertel & Rude, 1989, for a discussion of initiative during acquisition). If depressed persons experience deficits in processing initiative, they should perform poorly in retrieval tasks that are sensitive to such initiative. Initiative is encouraged by tasks that require judgments of prior occurrence, such as recognition, because such judgments can occur on a variety of bases ranging from feelings of familiarity (a very simple strategy, if one at all) to the use of complex reasoning. In contrast, the role of initiative is minimized in tasks that provide a useful strategy for judgments of prior occurrence. Consequently, depressive deficits should be minimized in such tasks.

Depressive deficits should also decrease in retrieval tasks that bypass judgments of prior occurrence by being represented as something other than a test of memory. The class of retrieval tasks that appear to bypass explicit attempts to remember is referred to as tests of remembering without awareness (Jacoby & Witherspoon, 1982), nonanalytic memory (Jacoby & Brooks, 1984), and implicit memory (Graf & Schacter, 1985). These tasks index memory for prior exposure to materials without subjects' awareness that their memory is being tested. They are nonanalytic tests of memory because the subjects do not analyze the occurrence of prior exposure to the materials on the test. Recently, Perruchet and Baveux (1989) questioned the assumption that nonanalytic tests should be lumped together with respect to the type of processing that they incur. Some of these tests (e.g., word completion clarification) produce performance that is correlated with performance on analytic tests such as recognition or recall. Certainly, the proper focus belongs on an examination of the processes involved.

In the following three experiments, we used retrieval tasks that reportedly are accomplished with and without awareness of remembering. In Experiment 1 we demonstrated a depressive deficit in remembering with awareness during a recognition task but no deficit on the test of remembering without awareness. (We examine issues related to awareness of remembering on that test.) In Experiments 2 and 3, we provided strategies for performing each task and expected no depression-related differences in performance.

In all three experiments, we used mood-induction procedures on nondepressed college students; the third experiment also included a group of naturally depressed students. We are not aware of any attempts to compare directly the performances of subjects with induced depression and naturally depressed subjects on memory tasks. Such a comparison is critical for an understanding of the research on depressive deficits because there are reasons to suspect that mood inductions do not produce a state that is similar to naturally occurring depression. Students who undergo mood-induction procedures describe their feelings differently. Some say that they feel lethargic but not really depressed. Lethargy, of course, is not clinically comparable with depression, although the two states may produce similar effects on cognitive tasks. If inductions do produce states comparable with clinical depression, subjects with induced depression may nevertheless perform quite differently than naturally depressed subjects; the latter may have developed methods for adjusting to their depression, whereas the former have experienced a very recent change in mood state and would have no particular motivation for such coping strategies. Alternatively, the two states may differ in their effects because attention to depressive musings characterizes natural depression and not the more transient mood. Clearly, a direct comparison of these two potentially different mood-related states is required.

Experiment 1

Apart from our manipulations and measures of mood, the procedures of Experiment 1 conformed to those used by Jacoby and Witherspoon (1982). The spelling of homophones (words that sound the same but have different spellings and meanings) served as their test of memory without awareness. In the first phase of their experiments, subjects were asked a series of questions. Homophones contained in some of the questions served as targets for the subsequent memory tests, and the questions were worded to reflect the homophones' less common meaning (i.e., "What color is a *pear*?"). The questions were read aloud by the experimenter, and the subjects responded in kind. In Phase 2 the experimenter read aloud nonhomophones and homophones, some of which were targets and the rest of which were distractors, and asked subjects to spell them. Spelling targets (vs. distractors) in the less common way indexed memory for the question phase.

The spelling test was followed by a recognition test. Both normal and amnesic subjects showed the effect of prior exposure by spelling more targets than distractors in the less common way, but amnesic subjects experienced the usual deficit in recognition. By using similar procedures, we expected to show a depressive deficit in recognition but not in performance on the spelling test.

In Experiment 1, mood was manipulated through the Velten Mood Induction Procedure (VMIP; Velten, 1968) before the question phase and then again before the tests of memory. The latter manipulation was our main concern; however, evidence for mood dependency in tests of memory with awareness (see Blaney, 1986) encouraged us to include the former manipulation as well. (If we had not included the first manipulation, a depressive deficit in spelling or recognition could result from a change in mood between study and test in the depressive condition and not in the neutral condition.)

We did not expect to find overall differences in spelling as a function of mood during the question phase. Because tests of memory without awareness seem unaffected by variations in the degree of analysis during prior exposure (see Jacoby & Dallas, 1981), any spontaneous use of strategies during questioning should not affect performance of the spelling test. In contrast, differences in recognition might occur as a function of mood during the question phase. Such differences would suggest that neutral subjects did something in addition to answering the questions that would make the targets more memorable.

Method

Overview

Choosing not to induce further depression in students with that tendency, we selected subjects who scored less than 6 on the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). Before the study phase, we induced a depressed or a neutral mood by using the VMIP and checked the manipulation with the Depression Adjective Check List (DACL; Lubin, 1965). The study phase consisted of 24 questions, read aloud. Embedded in 16 of the questions were targeted homophones; the questions were worded to reflect their less common meaning. Then the second mood induction was delivered; half of the previously neutral subjects and half of the previously depressed subjects were induced to feel depressed, whereas the other halves were placed in a neutral mood. In the subsequent spelling test, the experimenter read 32 words aloud (8 targeted homophones, 8 new homophones, and 16 nonhomophones) and asked subjects to give the first spelling that came to mind. Yes/no recognition followed, and 64 words were read aloud (the 16 targeted homophones, the 8 new homophones on the spelling test, 8 new homophones occurring for the first time, and 32 nonhomophones). The experimenter asked the subjects to tell her whether they remembered hearing each word in the questions she had asked earlier. A second check on the manipulation of mood was then performed. Last, we induced elation in those who had been subjected to a previous induction of depression.

Subjects and Design

Forty-eight subjects recruited from lower division psychology courses at Trinity University participated in exchange for course credit and met the criterion of scoring less than 6 on the BDI. All subjects were tested individually and were randomly assigned to one of the following conditions of the VMIP, with the constraint of equal *n*s: neutral study and neutral testing, neutral study and depressed testing, depressed study and neutral testing, and depressed study and depressed testing.

Materials

Homophones and questions. For the study phase, the 32 homophones used by Eich (1984) were equally divided into two lists, A and B. The median frequency (Kučera & Francis, 1967) for the homophones in each list was 11 (in comparison with 44 and 40 for the alternate spellings of the homophones in Lists A and B, respectively). Median ratings of subjective familiarity (Kreuz, 1987) were 493 and 473 for the homophones in Lists A and B, respectively (in comparison with 600 and 556 for their alternate spellings).[1]

The homophones from List A or B were presented to subjects in the context of questions (e.g., "What color is a *pear*?"). These 16 questions were worded to reflect the less common meaning of the homophones. Eight additional questions containing no homophones were used as fillers in order to disguise the nature of the targeted words. The questions for each list were arranged in three orders. The first order was random, except that the first and last questions were fillers. To obtain the other two orders, blocks of eight questions, as well as the questions within each block, were rotated, but the first and last questions again were fillers.

Spelling lists. To construct the spelling lists, the homophones in each list of questions were divided into two lists of 8 each. Then 8 homophones from each list of questions were placed on one spelling list, along with 16 nonhomophones; the remaining 8 homophones from each list and the same 16 nonhomophones constituted the other spelling list. The two spelling lists, then, each contained 8 targeted homophones, 8 new homophones as distractors, and 16 nonhomophones. On each spelling list the words were arranged so that each block of four words contained one target, one distractor, and two nonhomophones; the order within blocks was rotated across blocks. Across subjects, each homophone occurred equally often as a target and as a distractor.

The spelling lists were counterbalanced with the question lists, so that 3 subjects in each condition of mood induction were assigned to each of the four combinations of question and spelling lists. (Each of these 3 subjects heard the questions in a different order.)

Recognition list. A total of 64 words appeared on the recognition test: all 16 targets (8 spelled and 8 not spelled), 16 distractors (8 spelled and 8 not spelled), and 32 nonhomophones (the 16 on the spelling tests and 16 new homophones). The words were arranged in blocks of 16. Each block contained 4 targets, 4 distractors, 4 spelled nonhomophones, and 4 new nonhomophones, arranged randomly; the targets and distractors in each block all had been on the spelling test or unspelled, depending on which spelling list the subject had

[1] The medians for frequency and familiarity were computed after we conducted the experiment. In so doing, we discovered that four of the homophones on each list were presented in their more frequent or common form, according to the norms that we used. In the remainder of this report we assert that the questions biased the less common spelling of the homophones, but the reader should keep in mind that this assertion was not uniformly valid for Experiments 1 and 2. Nevertheless, no confound was introduced, given that the same homophones served as both targets and distractors in spelling and recognition.

heard. Spelled and unspelled homophones rotated across the four blocks.

Procedure

The subjects first completed the BDI. Those whose scores were greater than 5 were dismissed, and the remaining subjects underwent the VMIP. In this procedure for inducing moods, the subjects read 30 neutral or 30 depressive statements while seated alone in the testing room. Neutral statements were factual (e.g., "There are 26 breeds of cats"), whereas depressive statements were self-referential (e.g., "I am feeling sad today"). A tape recorder played beeps at a 30-s rate. Subjects were instructed to read each statement aloud and then silently until the beep occurred to signal the reading of the statement on the next page. The instructions encouraged all subjects to think only about the statement during its reading and experience it as true, but subjects in the depressive condition were also encouraged to be receptive to the mood described by the statement. (These are standard instructions for the VMIP.) After the mood induction, the subjects completed the DACL as a check on the manipulation. The DACL contains 32 adjectives that describe emotionally positive and negative states, and subjects are instructed to check the ones that describe their current feelings.

The first mood induction and manipulation check was followed by the study phase. The experimenter read the list of 24 questions aloud, and the subjects answered in kind. Subjects then received the second mood induction. Those who had previously read the set of neutral statements now read either a second set of 30 neutral statements or a set of 30 depressive statements. But the subjects who had previously read depressive statements were treated differently: In order to counteract the original depressive induction, subjects passing into the neutral condition read 15 neutral statements and 15 elated statements; in order to maintain rather than increase a depressive state, subjects passing into a second depressive induction read 15 neutral and 15 depressive statements. In these sets of combined statements, the nature of the statement alternated.

The spelling test was administered immediately after the second induction. The experimenter said, "I am going to read some words to you and I want you to spell them for me. I want you to give me the first spelling that comes to mind." She paced the reading at a rapid rate and, if subjects paused, reminded them to spell quickly. Subjects spelled aloud, and the experimenter recorded the nature of the spellings (in line with the question's context or the alternate meaning).

Instructions for the subsequent recognition test were as follows:

> I am going to read some words to you and I want you to tell me if you remember hearing those words in the questions I asked you earlier—not in the statements that you read or in the spelling test, only in the questions I asked you earlier. Please respond yes or no. I also want you to rate your confidence in your decision on a scale of 1 to 5, with 5 being the most confident.

The list of 64 words was then read, and the subjects responded orally.

After the recognition task, subjects completed a second DACL as a check for the second manipulation of mood. Before their debriefing, the subjects who had been induced to feel depressed read 30 elated statements from the VMIP. These subjects were also interviewed carefully in order to ensure that they left the experiment in a nondepressed state. During debriefing for all subjects, the experimenter asked questions that were designed to reveal their subjective experiences during spelling. Specifically, she attempted to discover whether any subjects viewed the spelling test as a test of memory for words in the previous questions.

Results and Discussion

Interesting consequences of the mood induction before testing were obtained, and they offer support for the proposal that the depressed students experienced deficits in processing initiative during the retrieval tasks. However, the results failed to show evidence of mood dependency (see Blaney, 1986, for a review that emphasized the many failures to find mood-dependent memory), although the manipulation of mood was confirmed by scores on the DACL (see the following section). The results also failed to show effects of the mood induction before the question phase on the subsequent spelling *and* recognition tests. The question task seemed to have encouraged similar degrees and types of processing by neutral and depressed subjects.

In the reports of analyses performed on spelling and recognition, we ignore the factor for the first mood induction, although the factor was included in those analyses, along with a between-subjects factor for mood at testing and a within-subjects factor appropriate to the measure of memory (i.e., prior exposure—target vs. distractor—for analyses of spelling performance, and the spelling status of the homophone for analyses of recognition). For all analyses, the significance level was set at .05.

Mood Indices

Scores on the BDI did not differ reliably according to conditions of mood during study or testing (means ranged from 1.92 to 2.83). Scores on the first administration of the DACL were analyzed with mood during study as a factor. The mean score was 8.08 for subjects in the neutral condition and 15.25 for those in the depressed condition; the difference was reliable, $F(1, 46) = 30.61$, $MS_e = 20.138$. Scores on the second administration were analyzed with factors for mood during study and mood during testing. Only the main effect of mood during testing was reliable (7.42 for neutral condition vs. 12.08 for depressed condition), $F(1, 44) = 16.82$, $MS_e = 15.534$.

Spelling

The effect of prior exposure to homophones on the spelling test (proportion of targets spelled in the less common way, in comparison with the proportion of distractors) served as a measure of memory without awareness. The spelling test indexed similar performance by neutral and depressed subjects. The mean proportion of targets spelled in line with the questions (the less common way) in *each* condition was .41, which was significantly larger than the mean proportion of distractors that were spelled in the less common way (.34 for neutral mood and .26 for depressed mood), $F(1, 44) = 9.54$, $MS_e = 0.029$. (The difference for distractors alone was not reliable at .10, nor was the interaction of prior exposure with mood during testing.) In interviews at the end of the experiment, all subjects reported a lack of awareness of the spelling test as a measure of memory for words in the list of questions. According to these self-reports, if they did notice a relation between the questions and the spelling words, they neverthe-

less gave the first spelling that came to mind. They did not attempt to spell in line with the questions, probably because the experimenter stressed immediate responding in the spelling task.

Recognition

In recognition, strategies can be elected. One strategy would be to consult the status of the word on the previous spelling test—to use spelling as a means of gaining access to the question. Depressed subjects' performance was not correlated with how the word had been spelled or with *whether* it had been spelled (see Table 1, top half). Recognition was independent of spelling. In contrast, neutral subjects were more likely to report recognition if they had spelled the word in line with the questions (biased) than if they had used the more common spelling (unbiased) or had not spelled it.

These conclusions are based on an examination of the proportion of affirmative responses conditionalized on the spelling status of the targets (spelled in line with the questions, spelled in the unbiased way, or not spelled).[2] The interaction of mood during testing (neutral or depressed) with spelling status was reliable, $F(2, 88) = 4.04$, $MS_e = 0.056$. When neutral subjects had spelled targets in line with the questions, they benefited on the later test of recognition. The mean proportion of hits was .70 for neutral subjects, in comparison with .52 for depressed subjects, $F(1, 44) = 4.74$, $MS_e = 0.078$.

Both gamma and phi coefficients were also computed to represent the association between spelling and recognition performance by each subject. The analysis of gamma showed a marginally reliable effect of mood at testing (*M*s = .33 for neutral mood and −.03 for depressed mood), $F(1, 44) = 3.26$, $MS_e = 0.468$, $p < .08$. The effect was reliable for phi (.22 vs. −.04), $F(1, 44) = 6.42$, $MS_e = 0.122$.

Neutral subjects showed evidence of correlated performance on spelling and recognition, perhaps because they noticed the connection between the spelling words and the questions during the spelling task. In other words, perhaps spelling did not constitute a test of remembering without awareness. However, if they did notice such a relation during the spelling task, they did not make use of that knowledge in spelling the homophones; their spelling performance was comparable with the performance by subjects with induced depression. Nevertheless, noticing the relation could constitute a practice trial in recognition memory. In line with this possibility is the finding that homophones spelled in the more common way by neutral subjects were less likely to be recognized than were unspelled homophones. In Experiment 2 we told subjects to consider words from the questions while spelling, so that we could determine whether depressed subjects can profit from such a strategy.

Another account of the neutral subjects' superior recognition of targets that were spelled in line with the questions is that they used a strategy for consulting their previous spelling performance when making recognition judgments. As we suggested earlier, one way to recognize homophones—if one has noticed that some of the words on the recognition task had been spelled—is to recall how the homophone was spelled. Recalling accurately could provide the best route for retrieving the question context and thereby recognizing the homophone from the study phase. In Experiment 3 we instructed some subjects to check back to their spelling performance as a step in arriving at the recognition decision, and we predicted that the depressed subjects would perform as well as the neutral subjects when they were so instructed.

Experiment 1, however, provided *some* evidence that neutral subjects spontaneously consulted their spelling performance on the recognition test more frequently than did the depressed subjects. The neutral subjects made more frequent false alarms in response to homophonic distractors that had been spelled (mean proportion = .19) than to those that had not been on the spelling test (.08). Depressed subjects did not show such a difference in false alarms (.09 for spelled vs. .11 for unspelled). The interaction of mood during testing with the spelling status of the distractors was reliable, $F(1, 44) = 6.30$, $MS_e = 0.019$.

Table 1
Mean Proportion of Hits Conditionalized on Spelling Status: Experiments 1 and 2

Testing mood	*n*	Spelling status		
		Biased	Unbiased	Unspelled
Experiment 1				
Neutral	24	.70	.48	.59
Depressed	24	.52	.58	.56
Experiment 2				
Neutral	12	.84	.40	.65
Depressed	12	.80	.36	.56

Experiment 2

One purpose of Experiment 2 was to determine whether performance by neutral subjects and subjects with induced depression alike can benefit from a strategy for spelling homophones. All subjects were instructed to notice the relation between words on the spelling test and words in the questions. Again, we expected depressed subjects to perform without a deficit and spell at levels comparable with those by nondepressed subjects. It seemed that both types of subjects would notice relations on the basis of familiarity because they had little time for more analytic attempts to recognize homophones on the basis of retrieving questions.

Our more central aim, however, was to see whether providing depressed subjects with a strategy for spelling would help them on the subsequent test of recognition. In effect, the spelling test can serve as a second processing trial for homophones in the questions, particularly if the relation between the two tasks is observed. Knowing about the relation between the spelling and questioning phases should provide useful information for making recognition decisions.

Another change from the procedures of Experiment 1 concerned inductions of depressed moods. Because we failed to find evidence for effects of mood during study in Experiment

[2] Analyses of confidence ratings revealed effects that were very similar to the ones that we report here.

1, inductions were delivered in this experiment at the end of the question phase only. We wished to submit a conservative number of subjects to an induction of a depressive mood.

Method

Twenty-four students from lower division psychology courses at Trinity University volunteered in exchange for credit and met the criterion for mood inductions (BDI score < 6). With the constraint of equal *n*s, they were randomly assigned to receive either a neutral or a depressive induction, and within those conditions they were assigned in equal numbers to the question and spelling lists. The materials and procedures from Experiment 1 were used, with three exceptions: (a) The first mood induction and the first DACL were omitted, (b) confidence ratings were excluded from the procedure for recognition, and (c) instructions for the spelling test were changed to "I am going to read some words to you and I want you to spell them for me. You may find that thinking back to the questions will help you to spell the words."

Results and Discussion

Mood Indices

Scores on the DACL were higher for the subjects with induced depression than for the neutral subjects (13.33 vs. 9.58), although the difference was only marginally reliable, $F(1, 22) = 3.16$, $MS_e = 26.708$, $p < .10$. The mean scores on the BDI were roughly comparable (1.67 for depressed subjects and 2.25 for neutral subjects; $p > .40$).

Spelling

Again, no reliable differences according to mood induction were obtained in spelling performance. Only the effect of prior exposure was reliable, $F(1, 22) = 24.77$, $MS_e = 0.034$. Depressed subjects spelled 54% of targets and 29% of distractors in the less common way, whereas the comparable percentages for neutral subjects were 56 and 28, respectively. But levels of remembering were higher than in Experiment 1 (a .27 difference between targets and distractors in Experiment 2, in comparison with .11 in Experiment 1). Providing a strategy for spelling made the spelling test a test of memory with awareness and appeared to elevate the performance of neutral and depressed subjects.

Recognition

In the last two rows of Table 1 we present the results of recognition conditionalized on the spelling status of the targets. The proportion of affirmative responses in both conditions of mood depended on spelling performance, as indicated by a reliable main effect of the spelling status, $F(2, 44) = 28.39$, $MS_e = 0.041$. Effects involving mood were not reliable. Neutral subjects recognized 84% of the homophones that they had spelled in line with the question, 40% of those that they spelled in the unbiased way, and 65% of those that they had not spelled; the corresponding percentages for depressed subjects were 80, 36, and 56. Averaged gamma coefficients were .66 for neutral subjects and .78 for depressed subjects (the difference was not reliable). Averaged phi coefficients were .40 for neutral subjects and .45 for depressed subjects.

Last, the false alarm rates, which were highest for homophones spelled by neutral subjects in Experiment 1, did not differ according to mood in Experiment 2. False alarms in response to the homophones from the spelling test, however, tended to be more frequent than false alarms for new distractors (12% vs. 7%), although the difference was not reliable.

In summary, the mood-induced deficits of Experiment 1 disappeared in Experiment 2 when all subjects were instructed to notice relations that neutral subjects might have detected on their own analysis and through their own initiative. Both groups were more likely to recognize the targets that they had spelled in line with the questions than the other targets.

Experiment 3

In this experiment we directed some subjects to use a strategy *during recognition*, whereas other subjects followed our previous instructions. We expected to show depressive deficits in the undirected condition only. Subjects in the directed condition followed a series of steps in making their recognition judgments. They were directed (a) to judge whether the word had been on the spelling test, (b) to report how they had spelled it or how they would have spelled it if it had been on the spelling test, (c) to decide whether the word had been part of a question, and (d) to identify the question. We reasoned that if subjects used these procedures for recognition, they would most likely recognize words that they spelled in the biased way on the spelling test or on the directed test of recognition, or on both, and least likely recognize words that they spelled in the unbiased way. If the spelling test provided a rehearsal trial, as it seemed to do according to the results of the first two experiments, this strategy for recognition should affect performance regardless of mood, but particularly for depressed subjects. Some subjects in the neutral condition, we hypothesized, might use such a strategy on their own initiative.

Under each condition of the recognition task, we added a group of subjects who reported moderate to severe depression on the BDI, so that we could directly compare the conditions for obtaining deficits under naturally occurring depression to those for obtaining deficits from mood inductions. Mood-induction procedures produce transient mood states, and the effects of transient moods are interesting in their own right. However, their effects on memory should be compared with the memorial concomitants of natural depression, so that the diverse findings from mood-related memory investigations can be understood.

The focus of most research involving mood-induction procedures has been on mood congruency—the compatibility between the nature of the mood and the nature of the materials to be recalled (see reviews by Blaney, 1986; Johnson & Magaro, 1987). Overall deficits (regardless of congruency) are sometimes found and sometimes not, but the emotional nature of the materials presents a complex puzzle. In Experiments 1 and 2, some meanings of some homophones were emotional in nature. When we performed analyses of data

that excluded these emotional homophones, we obtained the same pattern of results that we report here, probably because the questions that provided their context were not emotional. However, on the grounds of simplicity, we selected emotionally neutral words for Experiment 3.[3] We also designed the materials in ways that would allow us to examine the recognition of nonhomophones.

Method

Materials

Homophones were chosen from a list compiled by Kreuz (1987) and submitted to an independent group of 20 subjects for ratings of emotionality. Subjects rated both meanings of the homophones, as well as nonhomophones, on a scale of 1 (*not at all emotional*) to 7 (*extremely emotional*). On the basis of minimizing the median ratings of emotionality, 24 homophones were selected for use in the experiment. They were divided into four lists of 6 homophones each. We made assignments to lists by attempting to equate the lists on the following eight indices: median emotional values for both the less common and the more common spelling; median frequencies (see Kučera & Francis, 1967) for both spellings, plus the difference in frequency between the two; and median familiarities (see Kreuz, 1987) of both spellings, plus the difference in familiarity between the two. The range of median emotional values across lists and spellings was 1.18–1.71. Median differences ranged from 52 to 62 for frequencies and from 83 to 109 for familiarity ratings.

Twenty-four nonhomophones were chosen on the basis of emotional ratings and number of letters that were similar to those of the 24 homophones. Their median frequency of 30 fell between the frequencies for the less common spelling of the homophones (*Mdn* = 10) and the more common spelling (*Mdn* = 49). We also divided the nonhomophones into four lists of 6 each by attempting to equate the lists on median emotional ratings (which ranged from 1.48 to 1.88) and median frequencies (26 to 34).

Two lists of homophones and two lists of nonhomophones were combined to comprise the words for each list of questions (Question Lists A and B). Then, one list of 6 homophones and one list of 6 nonhomophones from each question list were combined to form Spelling List 1; the other 12 words from each question list formed Spelling List 2. Last, all 48 words appeared on the recognition list, together with 12 fillers that were chosen for their analogous frequencies, emotional ratings, and numbers of letters.

Nonhomophones appeared in the first two and last two questions on each question list; other words were randomly assigned to Questions 3–22, but no more than two homophones were allowed to occur consecutively. As in previous experiments, the questions were worded to reflect their less common meaning. Each block of eight words on the spelling lists contained two homophones and two nonhomophones from Question List A and two of each type from Question List B; within blocks the words were randomly arranged with the constraint that two words of the same type and question list could not appear consecutively. Last, each block of 10 words on the recognition list contained two fillers and one word from each combination of question list, type of word (homophone vs. nonhomophone), and spelling list. Within blocks the words were randomly ordered with the constraint of no consecutive occurrences of words from the same question list *and* spelling list and with a limit of two consecutive occurrences of homophones.

Subjects and Design

A total of 91 students at Trinity University participated in exchange for credit in their lower division psychology courses. They were selected for participation by the following method: BDIs were distributed to lower division psychology classes, in which students were asked to fill them out anonymously and return them in sealed envelopes, along with a signed consent form. Paula Hertel scored the BDIs, recorded the scores for later use, and constructed lists of nondepressed and depressed students (BDI scores < 6 and > 9, respectively). Experimenters scheduled these students for participation in the experiment.

Under constraints of equal *n*s, initially nondepressed subjects were randomly assigned to receive a combination of mood induction (neutral vs. depressed), recognition task (directed vs. undirected), question list (List A or List B), and spelling list (List 1 or List 2). Initially depressed subjects all received the neutral-mood induction and were randomly assigned to receive combinations of the other factors.

The BDI was administered again during the experimental session. An average of 13 days intervened between the first and second administrations of the BDI (14 days for depressed subjects alone). These procedures conformed to those suggested by Deardorff and Funabiki (1985) to ensure stability in depressed groups. They also served as a safeguard for the nondepressed subjects who would undergo induction procedures. Initially nondepressed subjects filled out the second BDI at the beginning of the experimental session, and those who scored higher than 5 were dismissed. Initially depressed subjects filled out the second BDI at the end of the experimental session, along with a form that was designed to rule out those with depressionlike symptoms due to illness, drug use, or sudden catastrophe (RDC form). The form was developed by S. Rude to reflect research diagnostic criteria (RDC) for minor or major depression (see Spitzer et al., 1978). Depressed subjects placed the forms in an envelope marked with their subject number and delivered them to the psychology department office. They were led to believe that these forms were part of a separate study. We used such deception because we suspected that depressed students might minimize their depression in the presence of a peer who was the experimenter. Again, only Hertel had access to these forms.

The data from 12 initially depressed students were eliminated from analyses and subsequently replaced because they did not meet our final criteria for natural depression (BDI score > 9 on both administrations and RDC). Of these 12 subjects, 3 failed to turn in their second BDI and interview form at the end of the session, 5 scored less than 9 on the second BDI, and 4 did not meet RDC.

Stringency for selecting naturally depressed subjects suggested that we use some criterion beyond the BDI for including neutral subjects and subjects with induced depression. The DACL is usually used as a check on the mood manipulation, but in this experiment we used it to ensure that our neutral subjects were not feeling bad and that our subjects with induced depression were not in a good mood. As a result, the data from 7 initially nondepressed subjects were eliminated on the basis of their DACL scores and were subsequently replaced. Three of these subjects participated in the neutral-induction condition but scored higher than 12 on the DACL (they checked no positive

[3] A proper investigation of mood congruency with homophones requires that only one meaning be emotional or that the two meanings have different emotional valences and, furthermore, that the less common meaning correspond to emotionality in some controllable way. Norms for homophones and emotionality are not sufficiently extensive for such control, if indeed it is possible.

adjectives and at least two negative adjectives). The 4 remaining subjects participated in the depression-induction condition but scored lower than 6 on the DACL (they checked no negative adjectives and at least five positive adjectives). In subsequent phone interviews by Hertel, these 4 subjects also said that they were not at all depressed by the induction procedure.[4]

In sum, analyses were performed on the data from 72 subjects, 12 in each of the six combinations of mood and recognition task. The procedure for counterbalancing question list and spelling list within each of the six conditions ensured that each word appeared an equal number of times across subjects as a spelled target, an unspelled target, a spelled distractor, and an unspelled distractor.[5]

Procedure

We used the procedures from Experiment 2 before the spelling test, which was administered according to the instructions in Experiment 1. After the spelling test, the experimenter consulted the instructions that assigned subjects to either the undirected or the directed recognition task and administered the appropriate test. Procedures for undirected recognition mimicked those used in Experiment 2. Instructions for the directed task were as follows:

> The next task is a recognition task. I will read another list of words. Your task will be to decide if each word occurred in the questions that I asked you in the first task. In order to help you remember, I will ask you a series of questions. The first question I will ask is "Was the word on the spelling test?" Please answer by saying "yes" or "no." If you answer "yes," I will ask you to remember how you spelled it. If you answer "no," I will ask you how you would have spelled it. Third, I will ask you if the word was in the set of questions in the first task and ask you to try to recall a question with that word in it. If you can, you will know that the word was in the question phase. Even if you cannot recall a question, please try to decide if the word occurred in the question phase.

The recognition task was administered in accordance with those instructions. For example, if the word was *chin*, subjects were asked, "Was the word *chin* on the spelling test? How did you spell it [or How would you have spelled it]? Was the word *chin* on the question list? What question contained that word?" Subjects responded orally, and the experimenter recorded all four responses for each word.

After the recognition test, subjects filled out the DACL and were debriefed. Subjects with induced depression received an elation induction. Naturally depressed subjects were asked to fill out the BDI and RDC forms and deliver them to the office.

Results and Discussion

Mood Indices

Scores on the second administration of the BDI averaged 2.40 for initially nondepressed subjects (an upper limit was set at 5) and did not reliably differ according to assignment to recognition task or mood induction. The mean for depressed subjects was 15.29, with no reliable difference between recognition conditions.[6]

Scores on the DACL reflected assignments to mood conditions alone, $F(2, 66) = 9.62$, $MS_e = 30.780$. After we replaced neutral subjects and subjects with induced depression according to criteria for the DACL, their mean scores were 6.36 and 12.42, respectively, with no reliable effects of assignment to conditions of recognition. Naturally depressed subjects also averaged 12.42 on the DACL.

Spelling

The results of the first spelling test replicated those from Experiment 1. When the proportions of homophones spelled in the less common way were submitted to an analysis of variance, with factors for task (undirected vs. directed), mood (neutral, induced-depressed, and naturally depressed), and prior exposure (targets vs. distractors), only the main effect of prior exposure was reliable, $F(1, 66) = 17.74$, $MS_e = 0.033$. Targets were spelled in line with the questions 50% of the time by neutral subjects, 48% by subjects with induced depression, and 51% by naturally depressed subjects. The corresponding percentages for distractors were 40, 32, and 40. Across all conditions of mood and task, 50% of targets and 37% of distractors were spelled in line with the questions; this difference of 13% is similar to the difference of 11% in Experiment 1, although the overall percentages were higher. This difference was also apparently less than the difference of 27% that was obtained under more analytic conditions for spelling in Experiment 2, and it therefore suggests that subjects in Experiment 3 were not attempting to spell in line with the questions.

Recognition

In this experiment both homophones and nonhomophones were rotated through all conditions, appearing as targets that were on the spelling test, targets that were not, distractors that were on the spelling test, and distractors that were encountered for the first time on the recognition test. Our first analyses, then, were performed on all words. They included factors for task, mood, spelling status (on the spelling test or not), and type of word (homophone vs. nonhomophone). The dependent variable for this analysis was d'.

Directing subjects to use a strategy for recognition improved their accuracy overall, as indicated by a main effect of task, $F(1, 66) = 7.27$, $MS_e = 2.140$. The mean d's were 1.75 for undirected subjects and 2.21 for directed subjects. This effect, however, was attenuated by two interactions: Task × Type of Word, $F(1, 66) = 4.62$, $MS_e = 0.552$, and Task × Spelling

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[4] At the request of Trinity University's Internal Review Board, Paula Hertel phoned all subjects who underwent an induction of depression in order to determine whether the depressed mood had dissipated by the end of the session. (Only 1 of 28 said it did not, but she reported other reasons for feeling tired.) Hertel also asked these subjects to describe their mood during the experiment and classified their responses into one of the following categories: nondepressed (21%), questionable (18%), lethargic (18%), and depressed (43%).

[5] One assignment error was made. In the directed condition of recognition, 4 depressed subjects received Question List B and Spelling List 1, whereas 2 depressed subjects received Question List B and Spelling List 2.

[6] Verbal Scholastic Aptitude Test scores were not reliably correlated with scores on either administration of the BDI, with experimental conditions, or with measures of spelling and recognition performance.

Status, $F(1, 66) = 5.49$, $MS_e = 0.640$. Mean d's for homophones were 1.53 for undirected subjects and 2.18 for directed subjects; the corresponding means for nonhomophones were 1.97 and 2.24. Mean d's for spelled words were 1.47 (undirected) and 2.15 (directed); for unspelled words, they were 2.03 (undirected) and 2.27 (directed). As these means show, we also obtained reliable main effects of the type of word, $F(1, 66) = 8.10$, $MS_e = 0.552$, and spelling status, $F(1, 66) = 13.04$, $MS_e = 0.640$. Viewed as a whole, these results show that subjects under all mood conditions experienced more difficulties in undirected recognition, especially for homophones and for words from the spelling test.

None of the overall effects involving mood was reliable, but there was a trend for naturally depressed subjects to benefit most from the directions. The average differences in d' between directed and undirected recognition were .33 (neutral subjects), .44 (subjects with induced depression), and .62 (naturally depressed subjects).

Conditionalized Recognition of Homophonic Targets

In order to examine the more specific effects of directing the use of a strategy on the recognition of homophonic targets (as in Experiments 1 and 2), the proportions of homophones from the question phase that subjects correctly recognized were submitted to an analysis of variance, with factors for task (undirected vs. directed), mood (neutral, induced depression, and natural depression), and the status of the homophone on the spelling test (spelled in line with the question, spelled in the more common way, not on the spelling test). Means are presented in Table 2. Recognition reliably depended on the status of the homophone on the spelling test, $F(2, 126) = 8.77$, $MS_e = 0.070$. But this effect was attenuated by the marginally reliable three-way interaction, $F(4, 126) = 1.99$, $MS_e = 0.070$, $p < .10$.

We evaluated this interaction by examining differences according to spelling status within each combination of mood and task. Reliable differences obtained for neutral subjects in the undirected task, $F(2, 62) = 3.16$, $MS_e = 0.076$; as we found in Experiment 1, neutral subjects recognized targets most often if they had spelled them in line with the questions. However, to our surprise, recognition did not depend on spelling status for neutral subjects in the directed condition. The means show that our directions for recognition elevated neutral subjects' recognition of homophones that they had spelled in the more common way. (The results of analyses of directed recognition are relevant to this finding and are described in the next section.)

Neither depressed group showed differences according to spelling status in the undirected condition. In both conditions recognition was independent of spelling. Although there was a trend according to spelling status for the subjects with induced depression in the directed task, the directions did not elevate their recognition of homophones spelled in line with the questions (.53 of the homophones spelled in line with the questions were recognized by the "induced" subjects in the directed condition vs. .55 in the undirected condition). In contrast, the performance of the naturally depressed subjects in the directed task reliably depended on the spelling status of the homophones, $F(2, 64) = 8.43$, $MS_e = 0.064$; naturally depressed subjects recognized more homophones that they had spelled in line with the questions, fewer that they had spelled in the more common way, and more that they had not spelled. Their performance was similar to that of neutral subjects who were undirected in this experiment and in Experiment 1.[7]

Table 2
Mean Proportion of Hits Conditionalized on Spelling Status: Experiment 3

Recognition task	*n*	Spelling status: Biased	Unbiased	Unspelled
Undirected				
Neutral	12	.66	.39	.46
Induced depressed	11	.55	.40	.44
Naturally depressed	11	.50	.38	.46
Directed				
Neutral	11	.57	.60	.58
Induced depressed	12	.53	.32	.54
Naturally depressed	12	.68	.26	.54

Performance on Directed Recognition

The results thus far suggest that our strategy for recognition produced the expected effects for naturally depressed subjects only. Their overall accuracy in recognition was most improved by our directions, and they were most likely to correctly identify homophonic targets that they had spelled in line with the questions. Subjects with induced depression also showed improved accuracy, but requiring them to recall how they had spelled homophones did not increase their recognition of homophonic targets. Last, neutral subjects' recognition accuracy was improved by directions, and their pattern of recognizing homophonic targets was changed by those directions. In particular, their identifications of homophones spelled in the more common or unbiased way increased. As a means of understanding the effects of our instructions to subjects in the directed condition, we conducted analyses of their responses to the questions used in that task. In the following sections, we organize descriptions of those analyses

[7] An analysis of phi coefficients confirmed the trends in analyses of conditionalized recognition by revealing a reliable interaction of mood with task, $F(2, 60) = 3.90$, $MS_e = .146$. The means in the undirected condition and the directed condition were .32 and −.04 (for neutral subjects), .18 and .18 (for subjects with induced depression), and .15 and .46 (for naturally depressed subjects). Recognition depended on how the word had been spelled *only* when neutral subjects were not directed to use our strategy (.32) and when naturally depressed subjects were so directed (.46).

The interaction of task and mood in analyses of gammas was only marginally reliable, $F(2, 60) = 2.92$, $MS_e = .597$, $p < .07$. Means in the undirected and directed conditions were .59 and .00 (for neutral subjects), .36 and .21 (for subjects with induced depression), and .19 and .73 (for naturally depressed subjects). Again, reliable associations of spelling and recognition were found for undirected neutral-mood subjects and directed naturally depressed subjects.

with specific questions: (a) Did subjects remember which homophones they had spelled? (b) Did they remember which way they had spelled? (c) Did recognition depend on how homophones were spelled in the recognition procedure?

Did subjects remember which homophones they had spelled? If subjects were confused about which homophones they had spelled earlier, their ability to use the spelling test as a route to recognition would be impaired. In order to determine whether such confusions differed according to mood, the proportions of correct responses to the first question in the series ("Was the word on the spelling test?") were submitted to an analysis of variance. The analysis was restricted to homophones from the spelling test. Factors included mood, spelling status (spelled in the less common vs. more common way on the spelling test), and prior exposure in the questions (target vs. distractor). No reliable differences were obtained; the overall mean percentage of hits was 86. (In a separate analysis, false alarm rates for homophones not on the spelling test did not differ reliably as a function of mood or prior exposure; the mean percentage of false alarms was 07.) Thus differences in directed recognition should not be attributed to differences in memory for having spelled the words.

Did they remember which way they had spelled? The second question in the series was "How did you spell the word?" If subjects could not accurately remember how they had spelled homophones, they might not be able to profit from our strategy for recognition. So, in order to reveal possible differences according to mood, we performed an analysis of variance on the proportion of homophones from the spelling task that were spelled again in the same way. Factors included mood and prior exposure in the questions. Although the interaction of mood and prior exposure was not reliable, the means in the top section of Table 3 show a trend for neutral subjects alone to forget how they had spelled homophones from the question phase (Ms = .81 for targets vs. .92 for distractors).

Did recognition depend on how homophones were spelled during the recognition procedure? In previous analyses we examined recognition conditionalized on how homophones were spelled on the spelling test. But the data from directed recognition made it possible to examine recognition conditionalized on how homophones were spelled during recognition as well. In the second section of Table 3 we show the mean proportions of homophonic targets that were recognized; these proportions are contingent on how subjects spelled them on one versus two occasions. Only consistent spellings across the two occasions were included in these analyses. (The mean *number* of recognized targets that had been spelled in both ways was only .33 across all mood groups.)

The analysis of variance included factors for mood, way of spelling (less vs. more common), and the number of spelling attempts (two when the homophone had been on the spelling test vs. one if it was spelled only during recognition). Homophones spelled in the biased way (M = .66) were better recognized regardless of the number of spelling attempts (M = .36 for unbiased spellings), $F(1, 31) = 47.23$, MS_e = 0.068. However, spelling in the biased way did not help subjects with induced depression as much as it did the other two groups; the interaction of spelling with mood was reliable, $F(2, 31) = 3.38$, $MS_e = 0.068$.

Table 3
Performance on Directed Recognition: Experiment 3

Item	Mood: Neutral	Induced	Depressed
	Spelling accuracy		
n	12	12	12
Targets	.81	.97	.90
Distractors	.92	.92	.89
	Proportion correct recognition		
n	11	12	11
Biased spelling			
Twice	.69	.57	.71
Once	.74	.55	.70
Average	.72	.56	.70
Unbiased spelling			
Twice	.57	.30	.20
Once	.26	.48	.31
Average	.42	.39	.26

Note. Spelling accuracy refers to the proportion of times that a target homophone was spelled the same way on the directed recognition test as it was on the spelling test. *Proportion correct recognition* refers to the proportion of times that a homophone was correctly recognized from the questioning phase, contingent on how it had been spelled (biased or unbiased) on both occasions (twice) or on the recognition test only (once).

Last, the three-way interaction was marginally reliable, $F(2, 31) = 2.58$, $MS_e = 0.058$, $p < .10$. Recognition was not reliably improved by two consistent spellings in the biased or less common way, in comparison with only one (homophones not on the spelling test), regardless of mood. Yet two consistent spellings in the unbiased way did affect recognition differently across conditions of mood, as indicated by a reliable interaction of mood with the number of unbiased spellings, $F(2, 32) = 4.90$, $MS_e = 0.085$. Spelling twice in the unbiased way was associated with low recognition in the two depressed groups but with higher recognition by neutral subjects.

Summary. Examinations of performance on the separate steps of the recognition procedure revealed important clues for understanding how subjects used our strategy for recognition. First, naturally depressed subjects clearly profited from our directions. They quite accurately recalled how they had spelled homophones on the spelling test and subsequently used that information in recognition. In contrast, subjects with induced depression received less benefit from spelling targets in line with the questions. The benefit was larger when they had spelled targets twice (.57 for biased spellings vs. .30 for unbiased spellings) than when they had spelled them only once (.55 vs. .48), but even then the association with spelling performance was not much greater than for subjects with induced depression in the undirected test of recognition (.55 vs. .40).

Last, the neutral subjects outfoxed us in the directed recognition task. This task increased the accuracy of recognizing homophones, but not in the manner that we expected. Instead of an increase in recognition of targets spelled in line with the

questions, they showed an increase in recognition of homophones spelled in the unbiased way on the spelling test. We suggest that this tendency can be attributed to a recognition strategy that we had not anticipated. Perhaps the request to recall previous spellings alerted them to think of the alternative meaning and to use it as a route for retrieval. This possibility is consistent with their tendency not to remember how they had spelled.

In short, the directed task made recognition more complex for neutral subjects than for depressed subjects, perhaps because neutral subjects were more likely to use both meanings of homophones as routes for retrieving questions. Depressed subjects showed no evidence of having consulted both meanings of the homophones on the recognition test. We suspect that we would have to tell them to do so.

General Discussion

Our account of depressive deficits in processing initiative first anticipates depressive deficits in remembering when the task encourages spontaneous uses of strategies. In this regard, evidence for deficits in undirected tasks of recognition was produced in Experiments 1 and 3: Depressed subjects recognized fewer homophones that they had spelled in line with the questions than did neutral subjects. Furthermore, recognition was independent of spelling for depressed subjects only. Second, deficits are not expected in tasks in which strategies are inappropriate and in tasks in which they are clearly specified by the instructions. Strategies for remembering were bypassed in the spelling tests of Experiments 1 and 3, and deficits were not obtained. A spelling strategy was suggested in the instructions for Experiment 2 and used by neutral subjects and subjects with induced depression alike. Last, a strategy was provided for recognition in Experiment 3. Naturally depressed subjects made better use of the strategy than did subjects with induced depression. But the data from neutral subjects suggested that they had found yet another way to make their recognition judgments. In the following discussion of Experiments 1–3, we review the major findings and relate them to the resource-allocation hypothesis. We follow that discussion with a limited review of the literatures on depressive deficits, with an aim of relating them to an initiative perspective.

Experiments 1–3

Deficits in Initiative

Depressive deficits in recognition have rarely been documented; in most published experiments, researchers have used free recall as the test of memory. Nevertheless, we have shown some tendency toward depressive deficits in recognizing homophones. More to the point of these experiments, depressed subjects showed evidence of eschewing strategies for recognition that were adopted spontaneously by subjects in a neutral mood.

In Experiments 1 and 3, when the instructions did not suggest ways of performing the spelling or recognition tasks, depressed subjects' performance on recognition did not depend on whether or how they had spelled the previously presented homophones. In contrast, neutral subjects most frequently recognized targets that they had spelled in line with the questions and missed the ones that they had spelled in the more common way. What might they have done, on their own volition, that would lead to such a pattern in their recognition data?

The first locus of possible differences is the questioning task. Perhaps neutral subjects noticed homophones embedded within the questions. This opportunity for spontaneous processing can be de-emphasized because we did not find reliable effects as a consequence of manipulating mood before the questions. Another opportunity for spontaneous processing could be taken during the spelling test. Neutral subjects might have noticed targets from the questioning phase more frequently that did depressed subjects. Such awareness, however, did not affect how they spelled homophones, in view of the fact that spelling performance did not reliably differ according to mood. But attention to the biased meanings of homophones would serve as a second processing trial for the targets and make them more perspicuous on the recognition test. A different explanation of neutral subjects' performance points to strategic processing during recognition. Regardless of their awareness of targets during spelling, perhaps neutral subjects made recognition judgments by recalling how they had spelled homophones and by using the spelled meaning as a route to retrieving the question. Last, some combination of these two strategies might have produced the neutral-mood advantage in recognizing spelled homophones.

The Control of Strategies

Spelling strategy. In Experiment 2 a strategy for spelling took the form of a suggestion that subjects might be helped on the spelling test if they thought about the questions. This suggestion elevated the effect of prior occurrence of homophones because it turned the test of remembering without awareness into a test of remembering *with* awareness. (We did not use control groups to evaluate the size of the effect of prior occurrence directly, but performance on both spelling and recognition tests was substantially better than in the other two experiments.) More to the point, the spelling strategy dramatically increased recognition conditionalized on spelling to levels not found in Experiments 1 and 3. All measures of the association of recognition and spelling performance showed that subjects with induced depression performed as well as neutral subjects. Again, perhaps neutral subjects in Experiment 1 had used this strategy spontaneously, noticing relations to the questions as they spelled the homophones; perhaps they did not. Regardless, the strategy was effective in reducing the differences between neutral subjects and subjects with induced depression on the recognition test.

Recognition strategy. Half of the subjects in Experiment 3 were directed to recall whether and how they had spelled each word before determining whether the word had occurred in a question; they were also asked to recall the question. This strategy improved recognition particularly for homophones and, independently, for items from the spelling test. For

naturally depressed subjects, the strategy established strong dependencies between spelling and recognition, whereas the improved recognition by neutral subjects under directed instructions suggested the use of still another strategy that we had not anticipated: the use of both meanings of the homophones as routes for recognition judgments.

Subjects with induced depression had performed as well as neutral subjects when provided with a spelling strategy in Experiment 2, but directing them to use a strategy during recognition did not substantially improve their ability to use spelling performance as a guide. These different outcomes imply that noticing the relation between the questions and the spelling words was a critical requirement for the use of an effective strategy for recognition. Depression-induced subjects did remember how they had spelled homophones from the question phase, but they did not appear to make the connection between homophones on the spelling test and homophones in the questions.

In the directed-recognition condition, the connection between spelled and questioned homophones could be made at two junctures: during spelling or when the subject was asked to remember a question that contained the spelled word. The results from the undirected task indicate that neither depressed group noticed the connection during the spelling task; if they had done so, they should have performed as well as neutral subjects, according to the results of Experiment 2. On the other hand, the request to recall a question during recognition provided a second opportunity to notice the link between the spelled and questioned homophones, but this request was the least constrained step in the procedure for directed recognition. By implying that subjects might not be able to recall a question ("Even if you cannot recall a question, please try to decide if the word occurred in the question phase"), the instructions permitted the final recognition judgments to be made without attempts to recall questions. Why should subjects whose moods were induced take that "out" more frequently than would naturally depressed subjects?

The answer to that question should be pursued in future research. Any account that is based on only one comparison between the two depressed groups is premature. Here, we tentatively suggest an approach that emphasizes possible motivational differences. If the mood-induction procedure produced lethargy, these subjects might have expended less effort in attempting to recall a question. Furthermore, they could have easily attributed their lack of motivation to the induction procedure and had a good excuse to expend little effort. Naturally depressed subjects, in contrast, would less likely suspect our interest in depression and performance, given that all measures of depression in these subjects occurred after the recognition task. And even if they did suspect, they lacked the convenience of the external attribution; their depression was a characteristic of self and not of experimental context. In short, naturally depressed subjects might have been more motivated to perform well. Last, in proposing these motivational differences, we emphasize that naturally depressed subjects' tendency to attempt question recall was not a matter of initiating a strategy. The strategy was provided. Instead, it was a matter of motivation to use the provided strategy when it was not required.

Initiative Versus Resource Allocation

The roots of the resource-allocation account of depressive deficits are evident in research on naturally depressed populations and populations experiencing depression inductions. How do our findings inform this account? Clearly, spelling the words that we used is not an effortful task, and so no deficit would be expected. When the spelling test was converted into a test of memory with awareness in Experiment 2, the degree of effort required to relate the spelling words to the questions might not have been great enough to challenge the resources of subjects with induced depression. Yet the undirected recognition task was intuitively effortful for the participant; the proportion of affirmative responses to targets was modest under most conditions, and the intervening spelling test added an important source of interference. The resource-allocation account can easily accommodate the findings of deficits in undirected recognition but has greater difficulty adjusting to the conditions in which the deficits were eliminated (Experiment 2 and the directed condition of Experiment 3). It would be difficult to surmise that directed recognition was easier, given the requests to recall both spellings and questions before the recognition judgments. Although we cannot reject this possibility on solid grounds because we have no independent measure of effort, it seems quite unlikely to us and to the experimenters. Indeed, many subjects complained that the directed task was frustrating.

In their resource-allocation model, Ellis and Ashbrook (1988) predicted depressive deficits when tasks *require* greater degrees of cognitive effort. Our results, however, showed deficits (or at least differences) when greater effort was not required but merely possible. This distinction is important. Whereas Ellis and Ashbrook pointed to decrements in the effective use of cognitive strategies, they emphasized the requirements of the task. We suggest a clearer focus on the meaning of *strategy,* which connotes the use of operations that are *not* specified or required to do the task. Moreover, the use of strategies might or might not be effortful, depending on the degree of their prior practice. Even the selection of a strategy could be made somewhat automatically, given its frequent use under similar circumstances. Clearly, the usefulness of both the resource-allocation hypothesis and the initiative hypothesis depends on the development of these distinctions in further research.

Much of the evidence in support of the resource-allocation hypothesis was accrued from mood-induction procedures. Perhaps these procedures produce effects that differ from the cognitive concomitants of natural depression. Earlier, we interpreted such differences within a motivational framework. Although it is possible that inductions produce greater depletions or reallocations of resources than do those accompanying natural depression—that the induced mood is more intense (see Ellis, 1985)—our postexperimental interviews and the results from the DACL fail to confirm this hypothesis. But we wish to emphasize above all else the importance of comparing these two types of depressive moods in future research. *If* similarities are found, the manipulation of mood can reduce the ambiguity associated with the multifaceted syndrome of depression (see Ellis, 1985).

Relation to the Literature on Depressive Deficits

The literature on depressive deficits in remembering contains (a) research on mood and memory in which depressive moods have been experimentally induced, (b) studies of the association of memory performance with scores on self-report instruments such as the BDI, and (c) memory research in which depressed patients served as subjects. In the following sections, we describe research selected from each of those categories and research on depression in literatures outside the concern with memory. Our purpose is to show that an initiative account of depressive deficits is consistent with a wide range of prior research.

Mood Inductions

Ellis and his students have provided the bulk of knowledge concerning deficits caused by the induction of depressed moods. In the first of such studies, Leight and Ellis (1981) demonstrated deficits in the learning of strategies for recalling letter strings. In one condition (varied input), the learning task encouraged but did not instruct for the discovery of higher order meaning in letter strings. However, in the constant-input condition, such discovery was made more difficult, and learning was consequently retarded. After several study-recall trials with one list of items, subjects were transferred to a similar second task, under either varied or constant conditions. The important result for our purposes was that subjects who experienced a neutral mood and received varied input on the learning task detected the higher order meaning and transferred that strategy to the second task, regardless of their mood or the conditions of input during the second task. However, if subjects were depressed before the learning task, transfer performance was always worse. In a manner consistent with an initiative account, a depressed mood prevented the detection of the optimal strategy, but once this strategy was discovered under neutral conditions, depressed subjects used it effectively.

In later studies in Ellis's laboratory, a possible relation between depressed mood and the failure to use strategies could be merely inferred from the lack of constraint in their processing tasks. For example, Ellis et al. (1984, Experiment 3) found a depression-related deficit in free recall after an incidental semantic processing task. In each processing trial, neutral subjects and subjects experiencing mood inductions were asked to choose a word that sensibly completed a sentence. The incomplete sentence varied according to its difficulty of completion. An unexpected test of free recall was administered after the processing task and revealed a depressive deficit for words chosen for the more difficult sentences but not for words chosen for the easy ones. To Ellis et al., these results indicated that depressed subjects possessed insufficient resources to perform well under more difficult processing conditions. From our perspective, the subjects seemed capable making those more difficult decisions (i.e., "Does the word *dream* fit into *He was awakened by the frightening* _____?"); the error rate was low. We suggest that depressed subjects might not have attended carefully to the materials beyond making the decision. The procedures were sufficiently relaxed that they would be susceptible to attentional strategies spontaneously elected by subjects in a neutral mood.

Last, there are a few reports of failures to find depressive deficits with induction procedures. Ellis and Lane (cited by Ellis, 1985) found no decrements in the recall of generated words. The generating procedure might constrain processing to the degree that other strategies would not occur to nondepressed subjects. Bower, Gilligan, and Monteiro (1981) and Einstein and Ellis (cited by Ellis & Ashbrook, 1988) failed to find depressive deficits in recalling stories or expository text. Such failures suggest that texts provided depressed subjects with sufficient structure or that nondepressed subjects might not have developed special strategies for remembering texts and therefore failed to show an advantage over the depressed subjects. These suggestions for how previous research on mood inductions can be viewed from an initiative perspective are quite tentative. But they do offer directions for future investigations.

Naturally Depressed Students

Hasher and Zacks (1979) were perhaps the first investigators to propose that depressive deficits emerge primarily in effortful processing tasks. In their Experiment 4, depressed and nondepressed college students (categorized by BDI scores) performed an incidental semantic task, followed by recognition. The depressed subjects made fewer associative errors in recognition, which indicates that they processed the target words less elaboratively on the incidental task. As the authors suggested, low levels of elaboration might be attributed to a reduction in cognitive capacity. Yet the lack of associative errors might also reflect reduced initiative to go beyond the requirements of their incidental task.

In later work, Hasher, Rose, Zacks, Sanft, and Doren (1985) assessed depression in college students in a number of ways, including the BDI, and found no depressive deficits in the recall of stories. They concluded that studying stories of the type that they used is perhaps a task that is not difficult enough to show effort-related deficits. It may also be the case that studying those stories was not as susceptible to the spontaneous use of uninstructed strategies as are other tasks, and so the lack of a deficit would reflect a lack of initiative on the part of the nondepressed subjects.

Little research with naturally depressed college students has produced clear evidence of depressive deficits, and occasionally evidence of a depressive advantage has been recorded (see Hasher et al., 1985). Such an advantage in free recall was found by Hertel and Rude (1989), who attempted to replicate the results of Ellis et al. (1984, Experiment 3) with naturally depressed students rather than students with induced depression and with a more tightly constrained processing task. The target was displayed for 1 s only and was reported by the subjects at the end of the 8-s sentence display. Also, during these trials, a brief and slightly audible tone typically sounded. The subject's primary task was to decide whether the word fit sensibly into the sentence, and the secondary task was to press a button as soon as possible in response to the tone. The secondary tone-detection task served as a probe for the amount of available effort; longer latencies to respond to the

tone were offered as indices that fewer resources were available or that more resources were allocated to the primary task (see Tyler et al., 1979). The dependent measures in this experiment were the median latencies to respond to the probe for cognitive effort and the number of words produced on the unexpected test of free recall.

Depressed subjects took reliably longer to respond to the tone than did nondepressed subjects. At first blush, their longer reaction times might indicate that depression limited the amount of available resources and consequently postponed responses to the probe. One competing explanation for the longer latencies concerns possible motor retardation associated with depression, but it was eliminated in a subsequent experiment. A third and more compelling explanation rests on the results of the free-recall test: Depressed subjects actually recalled reliably higher percentages of items than did nondepressed subjects. The similar patterns in latencies and recall suggest that depressed subjects' capacity was allocated to the primary task, rather than being limited by depression. Moreover, processing words in the more difficult contexts produced longer latencies and better memory in *both* groups. These results obviously failed to show the deficit that was obtained by Ellis et al. (1984) when depression was induced. Why? Possible explanations are related to differences between induced and natural depression and to different degrees of constraint in the processing task, but further research must resolve those issues.

Depression Measured by Diagnostic Criteria

Clinicians have suggested caution in interpreting results from studies in which self-reported measures of depression (such as the BDI) are used without accompanying diagnostic procedures, because the BDI was not designed for diagnostic purposes (see Depue & Monroe, 1978). In this light, Hertel and Rude (1989) interviewed their subjects and selected those who met research diagnostic criteria for depression. Yet the majority of memory investigations with carefully screened depressed subjects have been conducted with patients or outpatients who are not college students (see the review by Johnson & Magaro, 1987).

The work of Weingartner and his associates dominates this category of research on memory deficits. In a frequently cited set of experiments with hospitalized depressed subjects and control subjects, Weingartner, Cohen, Murphy, Martello, and Gerdt (1981) manipulated the inherent and apparent organization of a list of words to be recalled. They obtained clear evidence that depressed subjects poorly detected, constructed, or used organization in list learning, but it is unclear whether they suffered the loss of capacity for organizing or the loss of initiative (also see Russell & Beekhuis, 1976).

In a more direct examination of capacity issues, Krames and MacDonald (1985) used a highly structured dual-processing task with varying degrees of cognitive load. Their results support an initiative hypothesis because they showed that depressed outpatients recalled more words from the beginning of the list under high loads than under low loads, but the reverse was true for the nondepressed outpatients. Krames and MacDonald concluded that as task-relevant demands increase, depressed people allocate less attention to depressive ruminations. Thus allocation of capacity might be better understood as controlled by task demands, rather than consistently hampered by depression.

Other Research on Depression

Outside the literature on memory, there are numerous references to depressive deficits in initiative. Retarded initiation of voluntary action serves as the motivational component in learned helplessness models of depression (see Abramson, Seligman, & Teasdale, 1978). For example, Abramson, Alloy, and Rosoff (1981) found depressive deficits in generating hypotheses for solving complex problems, but the deficits disappeared when a list of hypotheses was provided by the experimenter. In reviews of learned helplessness research and other models of depression, Coyne and Gotlib (1983) and Rehm (1982) related lack of initiative to deficits in self-monitoring and self-control.

Self-monitoring, according to Stuss and Benson (1986), is one of the activities of the prefrontal lobes, which are implicated in "nonroutine, novel situations that require new solutions" (p. 244). Frontal lobe functions are also loosely related to depression. Damasio and Van Hoesen (1983) and Schacter (1987) reviewed evidence for a link between frontal lobe damage, affective disturbance, and problems in planning, initiation, and maintenance of action. In short, neuropsychological research points to an area of the brain, the prefrontal region, that is implicated in depression and in deficits in processing initiative. But the possibility of such a linkage must be cautiously considered because the work is correlational and because many of the functions of the frontal lobes are served by other areas (Mayeux, 1983).

Directions and Implications

In a set of three experiments, we have sought to demonstrate the usefulness of a focus on initiative for understanding depressive deficits in remembering. The experiments included conditions for spontaneous, bypassed, and directed use of strategies within the context of spelling and recognition tests. Future research should be designed to explore the usefulness of an initiative account in other memory paradigms and attempt a more precise specification of the nature of the deficit, relating it to motivational accounts of depression.

Last, an emphasis on deficits in initiative might have useful implications for the treatment of depression. Knowing that depressed people can expend cognitive effort in processing tasks but often lack the initiative to do so, we might recommend that they engage in well-structured tasks instead of resigning them to function on low capacity. The therapeutic advantage is a short circuit in the spiral of depression: Well-structured tasks serve as distractions from depressive musings, and success in these tasks should produce therapeutic feelings of competence.

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