THE EFFECT OF MOOD CONTEXT ON IMPLICIT REMEMBERING

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Abstract

Two experiments were conducted to investigate whether mood dependent remembering occurs in situations where remembering is unintentional, or implicit. Experimentally induced moods (happy and sad) were used to create a distinctive context during the study and test sessions. In Experiment 1, performance on two implicit tasks, picture identification and category production, was examined when mood context was similar and dissimilar from study to test. Experiment 2 used a modified version of picture identification, and contrasted an explicit task (free recall) with an implicit task (word stem completion). The results are briefly discussed within a framework of transfer appropriate processing.
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The effect of mood context on implicit remembering

In recent years there has been a growing interest in the influence of affective states such as sadness, elation, or anger on memory and cognition. In this regard, affect or mood has been most commonly viewed as an internal context that, by virtue of its association with specific experiences, can influence remembering. Two basic findings have emerged from experimental studies: mood congruence and mood dependence (for reviews, see Blaney, 1986; Bower, 1981). Mood congruence refers to the finding that certain materials, having been previously associated with a specific affect, are more likely to be learned or remembered in a similar mood. Mood dependence refers to the finding that what one is exposed to in a certain mood—regardless of the affective valence of the material—will be remembered best when tested in the same mood.

The present paper is concerned with mood dependent remembering. In the literature, mood dependence effects are inconsistent and ephemeral, making some researchers question the theoretical importance, and indeed the existence, of the phenomenon (Bower & Mayer, 1989). Bower (1981), for instance, described a study that used posthypnotic suggestions to induce happy and sad moods in highly suggestible subjects. Every participant learned one list of
words while happy and a second list while sad. Later, the subjects were tested for recall of both lists in either a happy or a sad mood. Recall averaged 70% when learning and testing moods matched and 46% when they mismatched, signalling a strong mood dependent effect. Nevertheless, a direct replication attempt by Bower and Mayer (1985) failed to find this pattern of results. Conflicting outcomes -- some positive (e.g., Eich & Metcalfe, 1989; Mecklenbrauker & Hager, 1984), some negative (e.g., Johnson & Klinger, 1988; Wetzler, 1985) -- have also been obtained in studies in which moods were modified by nonhypnotic means.

The inconsistent results may be partly due to the procedures used to induce moods. The most robust mood dependent effects reported were obtained in studies involving patients with either manic depressive illness or multiple personality disorder -- conditions characterized by profound alterations in mood (Eich, 1989). Just as drug-dependent effects in animals are correlated with the amount of drug administered (Overton, 1984), mood dependent effects in humans might be correlated with the intensity of moods induced. In studies where subjects are from non-clinical populations, it is questionable as to how reliable the mood induction procedures are in establishing intense and distinctive moods. These analog or "induction" studies make up the bulk of the mood dependence literature.
The most widely used technique is the Velten Induction Procedure (Velten, 1968). Subjects are asked to read and internalize (or experience) the mood suggested by numerous self-referent depression or elation statements. The statements concern self-evaluation and suggestions of somatic states characteristic of a given mood. The Velten procedure induces moods that are mild and short-lived in 50 to 70% of subjects, and results in no mood change for the remainder (Clark, 1983). The percentage of unchanged subjects may be even larger, since the method of assessing mood after induction is often the Depression Adjective Checklist (Lubin, 1967). This instrument includes many of the same words, or synonyms of the words contained in the statements on the Velten cards, and there is probably a high demand for subjects to check off these items.

Other techniques have tried to create moods through more natural means. The procedures usually last only a few minutes. For example, Ellis (1983) had subjects watch a 3 minute videotaped segment of either a funny or sad movie. Isen, Shalker, Clark, and Karp (1978) had subjects play a video game that was rigged so that some subjects won, while others lost. Neither of the studies used any independent mood measures after induction and therefore merely assume that the procedures were successful in inducing the desired mood.
The favored mood induction technique of Bower and his colleagues (Bower, Monteiro, & Gilligan, 1978; Bower & Mayer, 1985; Bower & Mayer, 1989) is posthypnotic suggestion. While this technique may produce stronger, more stable moods, Spanos (1986) has argued that posthypnotic suggestion is merely a response to social demand, so that subjects are acting "as if" they are experiencing a certain mood, regardless of whether or not it is truly present. This issue aside, these studies use a very select group of highly suggestible subjects and confound two states — mood and hypnosis — and thus suffer from a problem of generalizability.

A promising alternative to the induction procedures so far discussed is music coupled with personal memories (Clark, 1983; Eich & Metcalfe, 1989). Subjects listen to selections of music chosen to be suggestive of a specific mood and are asked to dwell on mood congruent events from their past. Clark (1983) found that this procedure induces moods that are more intense and longer lasting than the Velten for over 90% of subjects. Eich & Metcalfe (1989) used this procedure, and allowed subjects to take as long as they needed to induce the mood. They measured mood periodically until a preset criterion had been reached to ensure that subjects were indeed experiencing an intense mood before beginning the experimental tasks. Extensive
procedures like music induction might be more likely to produce distinctive mood states. It should be noted that Eich and Metcalfe's (1989) study was successful in producing mood dependent remembering. Whether this procedure will increase the consistency of the effect is a matter for further research.

A second factor that appears to be important in the expression of mood dependent remembering is the nature of the task demands, both at study and at test. Most studies (e.g., Bower, Monteiro, & Gilligan, 1978; Bower & Mayer, 1985; Leight & Ellis, 1984; Wetzler, 1985) have induced a mood and then simply asked the subject to memorize a list of words. These studies rely on contiguity alone between the material and mood to produce the hypothesized effect, the assumption being that mood dependence is the result of processes that are automatic and unmotivated. Thus, mood dependence arises from the inherent structure and processes of the memory system, rather than from processes initiated and carried out by the subject (Bower, 1981; Blaney, 1986; Clark & Isen, 1982; Hasher & Zacks, 1979). However, there is evidence that mood dependent effects are manifest under conditions that emphasize processes under the control of the subject, or as Craik (1983) has referred to them, "self-initiated processes" which include various encoding and retrieval strategies. By this account, tasks that are
sensitive to mood effects are those that encourage mood-distinctive encoding during study and, similarly, mood-distinctive retrieval during test (Eich, 1989; Eich & Metcalfe, 1989). Evidence comes from studies that have shown mood dependence to be more pronounced when subjects have to rely on internal resources, rather than on external aids, to generate both the target events at encoding and the cues required for their retrieval. Reliance on internal resources may make the internal state (here, a distinctive mood) more salient to the task at hand, and increase the probability that it will be included in the encoding and retrieval process (Eich, 1980; Overton, 1984). As an example, Eich and Metcalfe (1989) asked subjects either to read a target item that was paired with a category name and a related exemplar (e.g., milkshake flavors: chocolate - VANILLA), or to generate the item when primed with its initial letter in addition to the category name and exemplar cue (e.g., milkshake flavors: chocolate - V). They found that, relative to subjects whose study and test moods matched, those who experienced a shift in mood state recalled 32% fewer generated targets but only 18% fewer read targets. Further, this difference in performance occurred only in free recall, and not in recognition, where external, observable cues are available during testing.
Another study that found strong mood dependent remembering also used a study and test task, free association, that relies heavily on internally generated targets and test items. Weingartner, Miller, and Murphy (1977) had unipolar manic patients generate a series of associations to a single word cue on one day, and then to the same cue four days later. The procedure was repeated with a new cue on numerous occasions over several months, so that natural fluctuations in mood could be assessed between the four day intervals. The free association task proved sensitive to changes in mood; when mood was similar between the two sessions, an average of 35% of the original associations were reproduced, while when moods differed from study to test only 18% of the original associations were produced. Further, the degree of overlap of associative responses negatively correlated with the degree of mood change between sessions. It is, however, unclear in this study whether subjects were asked each time to reproduce their previous set of associations or to simply produce whatever set of associations came to mind.

This raises another issue that may be important in understanding mood dependence, but that to date has not been researched. Mood and memory studies have typically emphasized situations where subjects are intentionally trying to reconstruct details of a prior episode.
Performance on tasks such as recall and recognition has been referred to as explicit remembering. In recent years, however, much attention in memory research has focused on situations where remembering is unintentional, that is, where performance on a task (such as word identification or word fragment completion) is enhanced, or "primed", by prior exposure to information, but does not require that the subject consciously recollect any specific study episode. Performance on these tasks has been referred to as implicit remembering (see Graf & Schacter, 1985). Recent research has provided a wealth of evidence that explicit remembering differs in fundamental respects from implicit remembering (for review see Richardson-Klavehn & Bjork, 1988; Schacter, 1987).

This thesis focuses on the question of whether mood dependence occurs in situations where remembering is unintentional, or implicit. There are both intuitive and empirical reasons to suppose that mood effects might, at least in some situations, be implicit in nature. Since situational cues (such as a place or the presence of an object) can trigger an emotional experience, as in the case of phobias (Rachman, 1978), it seems reasonable to expect that mood might, in turn, act as an unintentional trigger for reexperiencing some prior event. In the research literature, mood has most often been discussed in terms of
its contextual value, and its effects have been likened to the presence of a drug that creates a distinctive internal context in which learning and remembering occurs (Overton, 1984). Indeed, Eich (1989) has suggested that drug state dependent remembering may be due in part to the distinctive mood created by a specific drug. As such, mood might act as an effective cue for implicit remembering, since empirical work has shown implicit remembering to be extremely sensitive to certain types of context. For example, performance on implicit tasks is generally better for information that was studied and tested in the same sensory modality (e.g. visual) than for information studied and tested in different sensory modalities (auditory at study and visual at test; e.g., Donnelly, 1988; Graf, Shimamura, & Squire, 1985). In contrast, explicit tasks such as recall and recognition performance typically show minimal effects due to similarity of modality context at study and test. Implicit remembering is sensitive, as well, to environmental context. Smith and Heath (in press) found that performance on a homophone spelling task (an implicit task) was higher when subjects were in the same distinctive room during study and test than when subjects were tested in a different, unfamiliar room. A change in environment did not, however, affect performance on an explicit test of recognition memory. To the extent that a mood forms a distinctive
internal context for the presentation of information in a similar manner to modality or environment, implicit tasks may be extremely sensitive to the presence of the same mood when remembering occurs.

Alternatively, it could be argued that mood dependence is specific to explicit remembering. Research has shown that semantic/elaborative processing facilitates explicit, but not implicit remembering (Graf & Mandler, 1984; but see Graf & Schacter, 1985). A distinctive mood may be encoded as elaborative information associated with the episode in which target materials are presented. The same mood present at a later time may help to reinstate explicit memory for details of the general episode, which then furnishes further cues to the specific target materials that the subject is asked to remember. A different mood might make it more difficult to retrieve the episode, thereby decreasing the recall of target information. Implicit remembering should not be affected by changes in mood context, however, since implicit remembering does not require reinstatement of a prior episode.

Kilhstom (1980) made a similar argument to explain the effects of posthypnotic amnesia. The posthypnotic suggestion, like the presence of a different, distinctive mood, creates a barrier between certain episodes and conscious retrieval mechanisms. He showed that posthypnotic
amnesia blocks access to explicit remembering in free recall, but does not decrease the amount of priming on a word association task -- a task that involves implicit remembering.

Thus, it is unclear whether or not mood dependence will occur in tasks that require implicit remembering. To investigate this question, two experiments were carried out. In Experiment 1, subjects were tested with several implicit tasks to assess whether remembering in these tasks is mood dependent. In Experiment 2, performance on several implicit tasks was contrasted with an explicit task, to see to what extent the effect of mood context was similar for explicit and implicit remembering.

Experiment 1

In this experiment, subjects were tested with two implicit tasks, category production and picture identification. Both study and test tasks were designed to emphasize self-initiated processes through internally generated responses with minimal reliance on external cues. Because previous studies suggest that interference designs may be more sensitive to the detection of mood dependent effects (Bower, Monteiro & Gilligan, 1978; Bartlett & Santrock, 1982; Schare, Lisman & Spear, 1984), subjects in Experiment 1 were exposed to materials while in two different moods (happy and sad) and were tested either in a
sad or happy mood for all of the materials. Thus, half the material had been studied in the same mood as experienced during test, and half had been studied in a different mood as experienced during test.

Method

**Subjects and design.** Thirty-six undergraduates participated in the study for course credit. There were 3 sessions for each individual over 3 consecutive days, with each session lasting approximately one hour. In session 1, subjects studied a set of materials in either a happy (H) or sad (S) mood. In session 2, subjects studied a second set of materials in the opposite mood to the one they experienced the previous day. During session 3, half the subjects were tested in S, half in H. Order of study mood was counterbalanced across test moods, creating 4 study-study-test groups: H-S-H, H-S-S, S-H-H, and S-H-S.

**Materials.** A mood scale was constructed in order to assess fluctuations in subjects' mood during a session. The scale, which is reproduced in Figure 1, consisted of two 20 cm lines, with the upper line marked "extremely unpleasant" and "extremely pleasant" at the end points, and the lower line marked "extremely low arousal" and "extremely high arousal" at the end points. The scale was based on a model of mood that emphasizes two bipolar orthogonal dimensions: pleasure-displeasure and arousal-sleepiness. Measurement
devices built on these two factors have been shown to be particularly useful and sensitive in repeated assessments of mood (Russell, Weiss, & Mendelsohn, 1989).
Figure 1

Mood rating scale given to subjects throughout the sessions, with the instruction to mark each line separately, reflecting how they felt at the present moment. Each line was 20 cm in length.

<table>
<thead>
<tr>
<th>extremely unpleasant</th>
<th>neutral</th>
<th>extremely pleasant</th>
</tr>
</thead>
<tbody>
<tr>
<td>extremely low arousal</td>
<td>neutral</td>
<td>extremely high arousal</td>
</tr>
</tbody>
</table>
For the category production task, 30 target words were chosen from Battig and Montague (1971) category production norms, each target taken from a separate category. The words were concrete nouns with no obvious emotional connotation, and the sixth or seventh most probable item to be generated from the category. The words were randomly assigned to 3 lists (10 words per list) that were counterbalanced across the three sessions. Thus, each list was used equally often as study items in session 1, study items in session 2, and as nonstudied items during the category production test to assess production baserates for those words.

For the picture identification task, 21 Thematic Apperception Test (TAT) cards (Murray, 1971) were assigned to 3 lists (7 pictures per list). The 21 pictures chosen were those most often judged to be affectively neutral by 20 pilot subjects who sorted the original 30 cards into 3 groups of neutral, happy and sad pictures. The three lists were used equally often as study items in session 1, study items in session 2, and as nonstudied items during the picture identification test to assess identification baserates for those items.

Mood induction procedure. The music and memory mood induction procedure followed at the beginning of each session has been used in previous mood studies and has been
shown to produce intense and relatively stable moods (Clark, 1983; Eich & Metcalfe, 1989). Before beginning the procedure, subjects were asked to fill in a mood scale.

For S induction, subjects sat in a reclining chair, and were asked to think back to an event from their past that was particularly sad, such as the loss of a personal friend or relative, and to try to recreate in their mind as much detail from the event as possible and to reexperience the emotion they felt at the time. During H induction, subjects were asked to recall a particularly positive event, such as a personal achievement, holiday, or family event, and to recreate as much detail as possible and to reexperience the emotion they felt at the time. They were not asked at any point what the nature of the event was that they were recalling.

Subjects were left alone in the room with music playing while they recalled their memory. Music during sad induction was either Albinoni's Adagio or Barber's Adagio con Cordes; during happy induction the music was either Mozart's Eine kleine Nachtmusik or Vivaldi's Four Seasons: Spring, Summer. In the test session, where subjects had already experienced a given mood, the music selection played was always the selection they had not heard previously. This ensured that the music itself could not act as a cue to reinstate the prior study episode.
Throughout the induction procedure, subjects were given the mood scale at five minute intervals, and asked to rate how they were feeling at the present moment. Since the induction method was primarily designed to influence the pleasure/displeasure component of mood, induction continued until subjects' pleasure rating was within 4 cm of the appropriate extreme on the 20 cm line; there was no criterion for the arousal rating. Once the pleasure criterion was passed, the session proceeded. Subjects completed the mood scale after each task during the sessions. If at any time their pleasure rating moved 3 cm toward the neutral point, they were given time alone to reinstate the mood using the above procedures.

At the end of each session, 8 subjects were offered refreshments and were engaged in conversation until their mood had returned to neutral before leaving the lab.

Study session 1. After mood induction, subjects were told that the purpose of the study was to assess mood fluctuations created by different types of cognitive tasks. This was to circumvent experimental demand for subjects to maintain an extreme mood, so that they felt free to report attendantuation in their mood during the session if it occurred. Subjects were not told that their memory for the materials would be tested.
First, target words for the category production test were presented in a study task that emphasized autobiographical remembering. Words from one of the three 10-item lists were presented verbally, in random order, one at a time. Subjects were asked to relate details about a specific event in their lives that the word brought to mind. One practice item preceded the list words. Subjects' responses were tape recorded.

After completing a mood scale and further mood induction, if necessary, one 7-picture set of the TAT cards was presented. Each picture was seen for 5 seconds, and the subject was asked to create a scenario suggested by the picture. As with the autobiographical study task, subjects' responses were tape recorded.

Study session 2. The following day, subjects were asked to induce the opposite mood that they experienced in session 1. Mood induction and study procedures were identical to session 1, except that a second list of category words and TAT cards were presented.

Test session. After mood induction of either H or S, subjects were tested for the materials that had been studied in the two previous sessions. The category production task was explained as a free association task. Subjects were given a category name, and asked to generate the first six items belonging to the category that came to mind. After
one practice category, 30 categories were presented in random order. These included 20 categories containing all the targets from the study lists in sessions 1 and 2, plus 10 categories containing targets from the third list that subjects were not exposed to during the study sessions. Thus, each subject provided category production baserates for one of the three 10-item lists.

The picture identification test followed category production. Each picture was covered with 15 filters made of super-fine artist's tracing paper, so that the picture was not visible. One of the filters was removed every 5 seconds, allowing the features of the picture to slowly become discernable. Subjects were told that their task was to identify and point out details of the picture as soon as possible. They were encouraged to guess if they were unsure. The number of filters remaining over the picture when it was correctly identified was recorded by the experimenter. The criteria for correct identification included 3 or 4 major features that had been consistently used to describe each picture by 20 pilot subjects prior to the study. Each subject was tested on 21 pictures, including the study sets from sessions 1 and 2, and the third study set that subjects had not seen previously. Thus, each subject provided picture identification baserates for one of the three 7-item picture sets.
After completion of the three sessions, the experiment was explained in full to subjects. They were asked for feedback on experimental procedures, and any questions they had were answered.

Results

The critical dependent measures were (1) mood ratings across each session, (2) priming in the category production task, as indicated by the percentage of studied target words produced above unstudied target words, and (3) priming in the picture identification task, as indicated by the difference in identification performance for studied and nonstudied items.

For the results of category production and picture identification, each subject had two sets of scores, one for the material studied during session 1, and one for the material studied in session 2. Analyses were carried out on the four critical study-test mood conditions (H-H, H-S, S-H, and S-S) first for the material with a one-day interval from study to test (material from study session 2), and separately for the material with a two-day interval from study to test (material from study session 1). The results for mood ratings, category production, and picture identification are presented separately. The alpha level for all statistical tests was set at .05, unless otherwise noted.
Mood ratings. Mean pleasure and arousal ratings are displayed for each session in Figure 2. At the beginning of sessions, pleasure and arousal ratings for all subjects were similar, and it took subjects similar amounts of time to establish a H mood (mean 19.26 mins) and a S mood (mean 21.94 mins). Separate ANOVAs (mood x session) for baserate pleasure ratings, baserate arousal ratings, and for time to establish moods confirmed these observations, with no effects approaching significance. Once moods were established, both pleasure and arousal ratings differed significantly between H and S before and after each task and across all three sessions; smallest mean difference (pleasure) = 8.55, t(34) = 13.6; smallest mean difference (arousal) = 4.58, t(34) = 3.8.
Figure 2
Pleasure and arousal ratings for happy and sad subjects (Experiment 1).

First Session (study)

Pleasant/High Arousal
Neutral
Unpleasant/Low Arousal

Autobiographical Memories
Pre Post
TAT
Pre Post

Happy mood
Sad mood

Second Session (study)

Pleasant/High Arousal
Neutral
Unpleasant/Low Arousal

Autobiographical Memories
Pre Post
TAT
Pre Post

Happy mood
Sad mood

Category Production Test
Pre Post
Picture Identification
Pre Post

Pleasure
Arousal

Third Session (test)

Pleasant/High Arousal
Neutral
Unpleasant/Low Arousal

Autobiographical Memories
Pre Post
TAT
Pre Post

Happy mood
Sad mood
Of particular interest is whether moods, once established, remained stable throughout the sessions. Looking at Figure 2, it is apparent that pleasure and arousal ratings for both H and S tended to move toward the neutral point after each task. Since pleasure levels prior to beginning each task were ensured because of a preset criterion, analyses were carried out on the difference scores between pre and post task ratings of both pleasure and arousal to provide an index of mood attenuation. The results indicated that there was consistently more attenuation of both pleasure and arousal ratings for S than for H. For both S and H, there was more attenuation of pleasure ratings during the autobiographical study task in Sessions 1 and 2 than during presentation of the TAT. There was no difference between tasks in the test session. Separate ANOVAs on pleasure and arousal ratings with mood as a between-groups factor, session and task as within-groups factors, confirmed these results. The pleasure rating analysis indicated a main effect of mood, $F(1,34) = 18.87$, $MSe = 11.03$, and a main effect of task, $F(1,34) = 18.41$, $MSe = 2.99$. The interaction between task and session was also significant, $F(2,68) = 4.16$, $MSe = 2.17$. Simple main effects showed a task effect for Session 1, $F(2,68) = 11.16$, a task effect for Session 2, $F(2,68) = 10.02$, but no task effect for Session 3, $F<1$. 
The ANOVA on arousal ratings indicated a main effect of mood, $F(1,34) = 17.13, MSe = 6.49$. No other effects approached significance.

**Category Production.** Each subject provided word production baserates for one of the three study lists. Thus, median baserates for each study list were obtained from 12 subjects (6 tested in H, 6 tested in S). Because of 4 words with 0 and 100% production baserates in lists 2 and 3, the highest and lowest baserate word from each list was excluded from analysis, creating lists of 8 words each. While median baserates between H and S did not differ, $t < 1$, median baserates for lists 1 and 3 differed significantly, $t(23) = 3.0$. Because of this difference, priming was determined by subtracting the appropriate list baserate from each subject's score.

Results on the category production task are summarized in Table 1a. Combined across one and two day intervals, there was significant priming in all study-test conditions, smallest mean difference = 8.32%, $t(17) = 2.16$. First, the critical study-test conditions with a one-day interval were analysed. H at study (13.94%) resulted in more priming than S at study (4.88%), while H at test (10.44%) was similar to S at test (8.38%). An ANOVA with study and test moods as between-group factors confirmed these observations, with a
main effect of study, \( F(1,32) = 3.79, \text{MSe} = 1.24 \), and no other effects approaching significance.

The critical study-test conditions with a two-day interval showed a different pattern of results. Overall, there was more priming with a two-day interval (14.91%) than with a one-day interval (9.41%). Study mood had little effect on the amount of priming (H, 15.94%; S, 13.88%) while S at test (20.13) enhanced priming over H at test (9.69%). An ANOVA, however, showed only a tendency toward a main effect of test, \( F(1,32) = 3.19, \text{MSe} = 1.96, p = .08 \). No other effects approached significance.
Table 1

Category production and picture identification performance for the critical study-test mood conditions (Experiment 1).

<table>
<thead>
<tr>
<th>Study-Test Moods</th>
<th>H-H</th>
<th>H-S</th>
<th>S-H</th>
<th>S-S</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a) Category Production performance:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>one day interval:</strong></td>
<td>priming(%)</td>
<td>13.25</td>
<td>14.63</td>
<td>7.63</td>
</tr>
<tr>
<td></td>
<td>s.d.</td>
<td>9.6</td>
<td>12.12</td>
<td>13.5</td>
</tr>
<tr>
<td><strong>two day interval:</strong></td>
<td>priming(%)</td>
<td>10.38</td>
<td>21.5</td>
<td>9.0</td>
</tr>
<tr>
<td></td>
<td>s.d.</td>
<td>18.0</td>
<td>12.1</td>
<td>19.25</td>
</tr>
<tr>
<td><strong>combined:</strong></td>
<td>priming(%)</td>
<td>11.82</td>
<td>18.07</td>
<td>18.32</td>
</tr>
<tr>
<td></td>
<td>s.d.</td>
<td>11.22</td>
<td>14.56</td>
<td>16.13</td>
</tr>
<tr>
<td><strong>b) Picture identification performance:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>one day interval:</strong></td>
<td>priming</td>
<td>10.22</td>
<td>6.94</td>
<td>16.56</td>
</tr>
<tr>
<td></td>
<td>s.d.</td>
<td>6.76</td>
<td>11.45</td>
<td>6.13</td>
</tr>
<tr>
<td><strong>two day interval:</strong></td>
<td>priming</td>
<td>11.94</td>
<td>14.5</td>
<td>12.5</td>
</tr>
<tr>
<td></td>
<td>s.d.</td>
<td>7.67</td>
<td>8.59</td>
<td>5.48</td>
</tr>
<tr>
<td><strong>combined:</strong></td>
<td>priming</td>
<td>11.08</td>
<td>10.72</td>
<td>14.53</td>
</tr>
</tbody>
</table>
**Picture Identification.** Each subject provided picture identification baserates for one of the three picture sets. Thus, the median baserate identification performance for each TAT card was determined from 12 subjects (6 tested in each mood) who identified the pictures without previous study exposure. Because of the large variability in baserates, priming was assessed per picture and then summed for each subject across the set of 7 target pictures.

The picture identification results are summarized in Table 1b. Each study-test condition combined across one- and two-day intervals resulted in significant amounts of priming, smallest mean difference = 10.72, \( t(17) = 4.49 \). As in the category production task, the results for each study-test interval were analysed separately. With a one-day interval, S at study (18.19) showed more priming than H at study (8.58). While it appears that same moods (15.03) resulted in more priming than when moods changed from study to test (11.75), an ANOVA confirmed only a main effect of study, \( F(1,32) = 12.2, \text{MSe} = 68.18 \), with no other significant effects. For the two-day interval results, the pattern is reversed; different moods (13.5) resulted in slightly higher performance than same moods (9.11). The ANOVA suggested a tendency toward a significant interaction, \( p = .10, F(1,32) = 2.7, \text{MSe} = 64.31 \), with no other effects approaching significance.
Discussion

The mood induction procedure was successful in establishing moods that were perceived as distinctive and intense according to subject ratings, although pleasure and arousal tended to attenuate during each task. Both pleasure and arousal ratings appear to be less stable when subjects were experiencing a sad mood than a happy mood. Some of this instability probably reflects regression to the mean since pleasure ratings were selected originally for their extremity. This cannot be the only source of the attenuation, however, since regression alone would likely have been equal for happy and sad moods. The greater attenuation for sadness over happiness is consistent with the hypothesis of positive-affect maintenance and negative-affect repair (Isen, 1984, 1985). This view, grounded in the social-learning theory principle of self-regulation, suggests that people are more motivated, and more able, to eliminate sad or negative feelings than positive feelings. Both moods, however, were less stable during the autobiographical study task than other study or test tasks. This difference may be due, at least in part, to the length of time it took to complete a task, since the autobiographical task took 15 to 20 minutes to complete, while all other tasks took less than 10 minutes.
The primary purpose of the study was to examine the effects of mood on implicit remembering, and more specifically, to determine whether remembering in these tasks is mood dependent. Two findings are important; first, there was significant priming obtained in both tasks in all the critical study-test conditions, and second, there was no evidence of mood dependent remembering in either task.

Although there was evidence of several main effects of mood on the amounts of priming obtained, the effects are confusing because of the obvious differences due to study-test interval. In the category production task, sad mood at test enhanced priming for the 2-day interval material, while happy mood at study enhanced priming for the 1-day interval material. The only clear effect in the picture identification task was that sad mood at study enhanced performance. This was most likely due to mood congruency since the TAT cards tended to be interpreted by subjects in negative or sad ways. An independent rater, rating the thematic content of 100 random samples of stories produced by subjects in both happy and sad study sessions, judged 58% of the stories to be negative, 32% neutral, and 10% happy. This is likely due to the fact that the TAT cards are generally weird, despite having excluded the really bizarre ones from the study set.
While both tasks may be useful in future mood
dependence studies since they showed significant priming
over fairly long intervals, some major methodological
problems arose. The first and most obvious problem was the
two-study session interference design. Because the pattern
of results differed so widely with one and two day study-
test intervals, it is likely that the effects of study
interval and mood were confounded. As well, since the types
of materials and procedures in the two study sessions were
identical, it is possible that the study sessions lost their
mood-distinctiveness. The design should be simplified to
only one study session and test session.

The major problem with the category production task was
the large variability in the baserates, both within each
list and between lists, although all the target items were
chosen to the same specifications from the Battig and
Montague (1971) norms. Because of this, priming had to be
assessed using list baserates provided by other subjects,
which left individual variability in the data that would
have been removed if priming had been assessed using each
subject's own baserate performance. As well, since the data
had to be analysed separately for each study interval, and
since some observations had to be dropped from the analysis
because of floor and ceiling effects, the number of
observations per cell were not large enough to overcome the
individual variability in the data. Before using the task again, pilot work should be done to ensure that production rates of targets are within a similar range, preferring around 30-40%.

In the picture identification task, there were several major problems. As mentioned earlier, the TAT pictures tended to be interpreted negatively; ideally the pictures used in the task should not have any obvious emotional bias so that mood congruency is not a confounding factor. The same baserate problems discussed with category production apply to the picture identification task as well. Finally, and perhaps most importantly, it is unclear whether remembering in this task was implicit. Each picture had a multiple item identification criteria (for example, a picture of a woman holding some books, with another woman standing nearby, and a horse & plow in the background). Subjects who had previously studied the cards, after first visually identifying one or two objects, were likely relying on explicit memory to furnish further details of the picture. Anecdotally, subjects consistently reported during debriefing that they knew the picture identification task was a memory test for the pictures they had seen previously, while no one suggested the category production task was anything other than free association.

Experiment 2
The second study investigated the effects of mood context on an implicit task using a simplified design with one study session followed by a test session. The task was a modified version of the picture identification task used in Experiment 1. Instead of TAT cards, color slides of common objects were used as target pictures. After studying the slides, subjects were tested with picture identification by first projecting the slides completely out of focus, and slowly bringing the pictures into focus until they could be named. Using pictures of simple everyday objects eliminated the multiple criteria problem present in Experiment 1, as well as the bias toward sad interpretation of the materials.

A second goal of Experiment 2 was to compare performance on an explicit and implicit task. The implicit tasks in Experiment 1 did not suggest mood dependent remembering. However, many studies in the literature have failed to produce mood dependent effects using explicit tasks (Bower & Mayer, 1985; Johnson & Klinger, 1988). Thus, in order to assess whether there is a dissociation of mood effects in implicit and explicit remembering, it is important to ensure that the mood induction procedures, materials, and study procedures would indeed obtain mood dependent remembering in an explicit task. To this end, subjects studied a list of words by producing autobiographical memories (as in Experiment 1), and were
tested in two ways, free recall followed by word stem completion. In the stem completion task, three letters were presented that could constitute the beginning of several words (e.g., spi____). Subjects were asked to complete the fragment with the first word that came to mind. This allowed a comparison of explicit and implicit remembering for the same set of materials and study procedures.

Method

Subjects and design. Sixty-four undergraduates participated for course credit or for pay. Subjects were tested individually in two one-hour sessions, with a 2 day interval from study to test sessions. Happy (H) and sad (S) moods at study were crossed with H and S moods at test, creating a 2x2 factorial design, with four study-test conditions; H-H, H-S, S-H, and S-S.

Materials. 38 words were selected for the free recall and word stem completion tasks from Graf and Williams (1987) word stem completion norms. The words were concrete nouns with at least 10 possible completions of the corresponding word stem. Sixteen of the words were chosen as targets, with a mean first completion base rate probability of .11, and range .06 to .20. The 16 targets were arranged into two random orders for presentation during study. Two words were added to the beginning of the study list to control for primacy effects. The remaining 20 words were used in the
word stem completion test as practice items (4 words) and as fillers (16 words). The test form consisted of the 4 practice stems followed by 32 stems (16 targets and 16 fillers) presented in one of two random orders. The 2 study list forms and the 2 test list forms were counterbalanced across study and test moods.

For the picture identification task, 22 color slides of everyday objects were obtained. 2 sets of 6 pictures were selected. Subjects saw one set during the study session interspersed with 8 filler items. The other set was used during testing to determine identification baserates. At test, the 6 studied and 6 nonstudied targets were randomly ordered for presentation, preceded by the remaining 2 slides for practice. The two sets were used equally often as study items and as nonstudied items during the test.

**Mood Induction Procedure.** The mood induction and rating procedures were identical to those followed in Experiment 1.

**Study Session.** Subjects were told that the purpose of the study was to assess the effects of mood on their interpretation of various materials. They were not told that their memory for the materials would be tested.

After mood induction, the word list was presented verbally, one word at a time. Subjects were asked to relate details of an experience in their past, preferrably over 1
year ago, that the word brought to mind. After relating each memory, subjects were asked for the approximate date of the event (month and year), and asked to rate the event for its pleasantness/unpleasantness at the time it occurred, its significance at the time it occurred, and the vividness of their memory for the event at the present. The rating scales were printed on paper and were given to subjects for reference during the task (see Figure 3). Subjects were time with a stopwatch from the presentation of each word until they indicated that they had retrieved a memory. The times were noted by the experimenter to the nearest second.
Figure 3

Subjects were asked to rate the autobiographical memories they produced for each study word with the scale below (Experiment 2).

Date of the event? (month and year)

Pleasantness of the event at the time it occurred
- 4 Extremely pleasant
- 3 Very pleasant
- 2 Moderately pleasant
- 1 Slightly pleasant
  0 Neutral
- 1 Slightly unpleasant
- 2 Moderately unpleasant
- 3 Very unpleasant
- 4 Extremely unpleasant

Importance of the event at the time it occurred
- 5 Extremely important
- 4 Very important
- 3 Moderately important
- 2 Slightly important
  1 Neutral (not important at all)

Vividness of the current recollection of the event
- 5 Extremely vivid recollection
- 4 Very vivid
- 3 Moderately vivid
- 2 Slightly vivid
  1 Vague recollection
After completing the autobiographical word study task, subjects were shown the color slides. Subjects were seated 7 feet from the screen, and the slide projector was 6 feet away from the screen. Each slide was presented for 3 seconds, after which subjects identified the object out loud, and related when they had last come in contact with the object, where, with whom, and the circumstances at the time. Because the objects were common, subjects related instances that were usually within the previous few days.

Test Session. Two days later subjects returned for the test session. After the appropriate mood was induced, the session began with free recall. Subjects were asked to think back to the first session two days earlier, and were reminded of the autobiographical word study task. They were asked to recall aloud as many of the target words as possible, and the experimenter wrote down their responses. Subjects were allowed to take as much time as they wanted, until they made no response for 1 minute.

Picture identification followed free recall. The lens on the slide projector was marked with a 30 mm scale, so that when set at zero, the slides were in focus. The lens was rotated away from focus and set at 30 mm from zero when a slide was first presented. At this point, no picture in the set was identifiable. Subjects were told that their task was to identify the object as soon as possible. They
were encouraged, with the presentation of each new slide, to guess as much as they wanted. Every second, the lens was moved 1 mm closer to the focal point. The experimenter recorded the subject's guesses, and the lens length away from focus when the picture was correctly identified. Thus, the larger the score, the more out of focus the picture was when the subject identified it. The test pictures included the set of 6 studied targets, and the second set of 6 targets that subjects had not seen previously. Thus, each subject provided identification baserates for one of the picture sets.

The last task in the session was word stem completion. Subjects were told that this was a free association task. They were given the word stems verbally, and were asked to complete the stem with the first word that came to mind. They were told not to give proper names. The categories included all 16 targets that had been studied in the previous session.

When the session was completed, the purpose and procedures in the experiment were discussed with the subject. They were asked for feedback on experimental procedures, and any questions they had were answered.

**Results**

A set of dependent measures that served to differentiate H and S conditions included pleasure and
arousal ratings from both sessions and the ratings given by subjects for the autobiographical memories they produced during the study session. The critical dependent measures for the studied words included the probability of recalling a target word and the probability of completing a word stem with a target word. Because stem completion followed free recall, some of target words had been recalled by subjects about 20 minutes earlier in the session. The results, therefore, are reported separately for stem completion of non-recalled words and for stem completion of recalled words. The dependent measure from picture identification was the amount of priming as indicated by the difference in lens length at identification between studied and nonstudied items. All alpha levels of significance were set at .05, unless otherwise reported.

For free recall, word stem completion and picture identification, analyses were carried out in two ways. The first set of analyses included all 64 subjects. There were, however, several subjects within each study-test condition that showed extreme mood swings, that is, by the end of a task their pleasure rating had moved past the neutral point into the opposite end of the scale. Thus, a second set of analyses were done excluding those subjects whose pleasure ratings during a specific task (either during study or during test) attenuated past the neutral point in either
direction. While the patterns of results did not change from the overall analyses, excluding these subjects tended to accentuate the effects, mainly by decreasing the variability in the data. The results from this second set of analyses are reported below. For free recall and word stem completion, 11 subjects were excluded: H-H n=14, H-S n=15, S-H n=10, S-S n=14. For picture identification, 12 subjects were excluded: H-H n=16, H-S n=12, S-H n=12, S-S n=12.

Mood ratings. The pattern of ratings was similar to Experiment 1. There were no differences in baseline pleasure or arousal ratings, or in time to induce H and S moods, across both sessions. Separate ANOVAs (session x mood) on baseline pleasure ratings, baseline arousal ratings, and on time to induce moods confirmed these observations, with no effects approaching significance. The results are displayed in Figure 4.
Figure 4

Pleasure and arousal ratings for happy and sad subjects (Experiment 2).

First Session (study)

Pleasant/High Arousal

Neutral

Unpleasant/Low Arousal

Autobiographical Memories

Pre Post

Slides

Pre Post

Happy mood

Sad mood

Second Session (test)

Pleasant/High Arousal

Neutral

Unpleasant/Low Arousal

Free Recall

Pre Post

Picture Identification

Pre Post

Word Stems

Pre Post

Happy mood

Sad mood

• • • Pleasure

■ ---■ Arousal
As in Experiment 1, pleasure attenuated more for S (mean 2.96) than for H (mean .78). Attenuation was greater for both S and H during the autobiographical study task (mean 3.33) than any other task (combined mean 1.5). For the pleasure ratings, two mood conditions (H and S) and 5 task conditions (autobiographical study, slide presentation, free recall, word stem completion, picture identification) were included in an ANOVA with mood as a between-groups factor and task as a within-groups factor. The analysis showed two main effects; a main effect of mood, $F(1,62) = 56.57$, $MSe = 6.7$, and a main effect of task, $F(4,248) = 14.3$, $MSe = 3.33$. For the arousal ratings, an ANOVA of similar design revealed a main effect of mood, with more attenuation for S (mean 2.38) than for H (mean -.42), $F(1,62) = 49.64$, $MSe = 12.61$. No other effects approached significance.

**Memory ratings.** The memory ratings served to further differentiate the H and S subjects during the study session. The results are summarized in Table 2, including the value of $t$ calculated to compare H and S subjects for each rating. H subjects produced more positive memories than S; S produced more negative memories than H. Because of this, the overall pleasantness ratings for H and S differed, but the pleasantness ratings for the positive or negative memories within each group did not differ; that is, H
subjects did not give more extreme ratings for the positive memories than did S subjects, and the same is true for negative memories in both groups. There were no differences in the latencies to produce memories, either for all the memories produced in each group, or separated into positive and negative memories within each group.
Table 2
Memory ratings given by subjects during the autobiographical study task in session 1 (Experiment 2).

<table>
<thead>
<tr>
<th>Study moods</th>
<th>Study moods</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>S</td>
</tr>
<tr>
<td>Mean pleasantness ratings for all memories produced</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>s.d.</td>
</tr>
<tr>
<td>Number of positive memories produced</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>s.d.</td>
</tr>
<tr>
<td>Time taken to produce positive memories (in seconds)</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>s.d.</td>
</tr>
<tr>
<td>Mean pleasantness ratings for positive memories</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>s.d.</td>
</tr>
<tr>
<td>Number of sad memories produced</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>s.d.</td>
</tr>
<tr>
<td>Time taken to produce sad memories (in seconds)</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>s.d.</td>
</tr>
<tr>
<td>Mean pleasantness ratings for sad memories</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>s.d.</td>
</tr>
</tbody>
</table>
Free recall. In determining a subject's probability to recall a word, those words for which subjects did not produce a memory during the autobiographical study task were excluded. No subject produced memories for fewer than 14 of the 16 target words. The results, summarized in Table 3a, provide evidence of mood dependent remembering: when study and test moods matched, more words were recalled (mean .33) than when study and test moods differed (mean .23). An ANOVA (study mood x test mood) showed a significant interaction between study and test moods, $F(1,49) = 8.94$, $MSe = .012$. Simple main effects analysis showed a significant effect of study mood when tested in H mood, $F(1,49) = 14.4$, $MSe = .012$, and an effect of study mood when tested in S mood, $F(1,49) = 7.73$, $MSe = .012$. No other effects in the ANOVA approached significance.
Table 3
Free recall, word stem completion and picture identification performance in the critical study-test mood conditions (Experiment 2).

<table>
<thead>
<tr>
<th>Study-Test Moods</th>
<th>H-H</th>
<th>H-S</th>
<th>S-H</th>
<th>S-S</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a) Free recall performance.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probability of recall:</td>
<td>.35</td>
<td>.22</td>
<td>.24</td>
<td>.30</td>
</tr>
<tr>
<td>S.D.:</td>
<td>.10</td>
<td>.10</td>
<td>.11</td>
<td>.13</td>
</tr>
<tr>
<td>Subjects in each group:</td>
<td>14</td>
<td>15</td>
<td>10</td>
<td>14</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study-Test Moods</th>
<th>H-H</th>
<th>H-S</th>
<th>S-H</th>
<th>S-S</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>b) Word stem completion performance for words recalled earlier in the test session.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probability of completion:</td>
<td>.24</td>
<td>.07</td>
<td>.17</td>
<td>.25</td>
</tr>
<tr>
<td>S.D.:</td>
<td>.18</td>
<td>.13</td>
<td>.20</td>
<td>.23</td>
</tr>
<tr>
<td>Subjects in each group:</td>
<td>14</td>
<td>15</td>
<td>10</td>
<td>14</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study-Test Moods</th>
<th>H-H</th>
<th>H-S</th>
<th>S-H</th>
<th>S-S</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>c) Word stem completion performance for words not recalled during the free recall test.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probability of completion:</td>
<td>.12</td>
<td>.12</td>
<td>.12</td>
<td>.21</td>
</tr>
<tr>
<td>S.D.:</td>
<td>.06</td>
<td>.11</td>
<td>.13</td>
<td>.17</td>
</tr>
<tr>
<td>Subjects in each group:</td>
<td>14</td>
<td>15</td>
<td>10</td>
<td>14</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study-Test Moods</th>
<th>H-H</th>
<th>H-S</th>
<th>S-H</th>
<th>S-S</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>d) Picture identification performance.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean priming per list:</td>
<td>16.13</td>
<td>29.25</td>
<td>11.33</td>
<td>20.33</td>
</tr>
<tr>
<td>S.D.:</td>
<td>19.15</td>
<td>12.96</td>
<td>13.53</td>
<td>17.5</td>
</tr>
<tr>
<td>Subjects in each group:</td>
<td>16</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>
Word stem completion. The results are summarized in Tables 3b and 3c. Because all items were test targets for every subject, no completion baserates were collected from this group of subjects. Thus the dependent measure of interest was the overall level of performance, and not priming. Performance was assessed in two ways. First, performance was assessed for those words that had been recalled earlier in the test session. Second, performance was assessed for those words not recalled during free recall, and excluding those items that subjects did not produce memories for during study.

Completion performance for previously recalled items showed a similar pattern of results as in free recall. Performance was higher in similar study-test conditions (mean .25) than for different study-test conditions (mean .12). An ANOVA confirmed this observation, with a significant interaction between study and test moods, F(1,49) = 5.53, MSe = .035, with no other effects approaching significance.

Completion performance for non-recalled words showed a different pattern of results. Although performance in the S-S study-test condition was higher than in all other conditions, no effects approached significance (p's >.2) in ANOVA.
**Picture Identification.** Each subject identified one set of the pictures without having seen them during the previous study session. Thus, median baserates were assessed for each picture from 16 subjects (8 tested in each mood). Because baserates differed widely for each picture, priming was assessed per picture and then summed across the set of 6 study targets for each subject. The results, summarized in Table 3d, indicated that in all critical study-test conditions there was significant amounts of priming, smallest mean difference = 11.33, t(11) = 4.61. For both study moods, S test mood resulted in higher priming than H test mood. As well, H study mood increased performance over S study mood. An ANOVA confirmed a main effect of test, F(1,48) = 5.81, MSe = 269.61, and a tendency toward an effect of study, F(1,48) = 2.23, p = .13. No other effects approached significance.

**Discussion**

There were three important findings in Experiment 2; first, remembering was mood dependent for free recall; second, word stem completion results differed for words recalled and not recalled during the test session; and third, picture identification performance was influenced by study and test moods, but not in a manner consistent with mood dependent remembering.
The free recall results clearly indicate mood dependent remembering; when subjects experience the same mood at study and test they remembered more than if they experience a different mood during the two sessions. This replicates findings in the literature (Eich & Metcalfe, 1989; Mecklenbrauker & Hager, 1984), and indicates that the autobiographical word study task coupled with free recall is sensitive to the effects of mood context. It also indicates that the induction procedures were successful in creating two distinctive mood contexts.

Word completion performance on previously recalled words displayed a similar pattern of results as in free recall. Performance in each study-test condition was a direct function of the number of words previously recalled and thus cannot be construed as mood dependent remembering. The word stem completion task for nonrecalled words, however, did not show the same mood dependent pattern of results. The lack of any mood effect in this task is probably due to floor effects. The overall level of target completion was very low (mean .14), and did not differ much from normative completion baserates for the same materials (mean .11) in Graf and Williams (1987). The category production task used in Experiment 1 was probably more sensitive to priming after an interval of 2 days because it allowed for 6 responses from subjects, rather than only one
per cue. A second possibility is that the stem completion task presented the subjects with too strong an external cue (the first three letters of the word) to be sensitive to mood, as in recognition tasks (see Introduction).

In picture identification, however, there was significant priming in each critical condition, and the amount of priming was affected by study and test moods. Clearly, however, remembering was not mood dependent. Priming was enhanced when subjects were in a sad mood, regardless of the mood they had experienced during the study session. This difference was not a function of overall baserate performance for happy and sad subjects during testing. For both target lists, baserate performance in the H and S test moods did not differ, $t's < 1$.

General Discussion

The primary purpose of the paper was to investigate whether mood dependence occurs in situations where remembering is unintentional, or implicit. Remembering in free recall (Experiment 2) was mood dependent, while none of the implicit tasks showed a pattern of mood dependent remembering. In Experiment 1, the results were unclear because of the study-test interval effects introduced by using an interference design, and it was questionable whether the picture identification task was truly an implicit task. In Experiment 2, word stem completion
performance did not differ from normative completion rates after the two day interval. The clearest indication of implicit mood effects was in picture identification (Experiment 2). The task did not show mood dependent remembering, however identification was enhanced by sad mood during the test regardless of the mood experienced during study. This effect was also present in the category production task (Experiment 1) for the material with a similar two day study-test interval.

The results suggest that the effects of mood context on implicit and explicit remembering may differ. Clearly, mood dependent remembering occurs in explicit tasks where subjects are intentionally trying to reconstruct a prior episode. In implicit tasks where remembering is unintentional, there are two possibilities. First, mood context may have no effect on implicit remembering. This, however, is not suggested by the present study, since all the implicit tasks (with the exception of word stem completion where no remembering was indicated) showed main effects of mood on performance. A second possibility, then, is that moods may effect implicit remembering, but in ways that differ from explicit remembering.

The results of the picture identification task (Experiment 2) suggest that sad mood enhances priming regardless of the mood during study. The difference was not
due to some overall change in perceptual ability, since baserate performance for happy and sad subjects did not differ. One possibility is that subjects in a sad mood rely more on processes involved in implicit remembering. In this regard, Graf & Mandler (1984) have made a distinction between two types of memory organizing processes, integration and elaboration. Integrative processing bonds the various features of a target into a coordinated whole or unitized representation. Integration facilitates implicit remembering because once unitized, a representation has the tendency to become reconstructed, or "reintegrated" when only some of its features are represented. Elaborative processing encodes a target in relation to the experimental situation (e.g., other targets, situational cues, prior knowledge), and thus facilitates explicit remembering by establishing an association between each target and the specific learning episode.

Is there any evidence in the extant literature that happy and sad moods result in processing differences? Two findings are of interest here. First, sad subjects engage in less structuring and organizing of material when it is presented than neutral or happy subjects (Weingartner, Cohen, Murphy, Martello, & Gerdt, 1981), that is, they do not spontaneously use elaborative processing. Secondly, when sad subjects are given a task that forces them to
engage in some kind of elaborative processing during study (such as embedding words in complex meaningful sentences), it does not have as much beneficial effect at retrieval as with neutral or happy subjects (Ellis, Thomas, & Rodriguez, 1984). These findings would suggest that sad subjects do not engage elaborative processes either during encoding or retrieval, and may thus be relying on integrative or redintegrative processes.

One finding from the picture identification task in Experiment 2 lends support to this. The subjects who were sad during picture identification guessed at the pictures far less (mean guesses, 8.7) than happy subjects (mean guesses, 20.06), \( t(24) = 5.23 \). Consistent with previous research, happy subjects worked at imposing structure on the pictures that were presented to them to a greater extent than their sad counterparts. The enhanced priming in a sad mood might be because this effortful, elaborative processing overrides, or interferes with, the redintegrative process. This, however, is a matter for further investigation.

How might this difference in reliance on one type of processing or another explain mood dependence in free recall? Morris, Bransford, & Franks (1977) reasoned that performance on a memory test is expected to be facilitated to the extent that it engages the same set or a similar set of cognitive operations as a preceding study task; more
generally, remembering is determined by the degree of overlap between study and test processing. This view of remembering is generally known as Transfer Appropriate Processing (TAP). If sad and happy moods result in reliance on two different types of organizational processes, then reinstating a mood from study to test will result in a similar set of processes being engaged, thereby increasing memory performance. A change in mood will result in a different set of processes being engaged at study and at test, thereby decreasing memory performance.

The above account is speculative, at best, since only one explicit task (free recall) and one implicit task (picture identification, Experiment 2) were clean enough methodologically to show clear results. The finding of a dissociation between mood context in implicit and explicit remembering would be much more compelling if it had arisen in two tasks using similar materials, study procedures and test situations. For example, a good test of this account would be to compare performance between category production and category cued recall. This way, the materials, the study procedures, and the cues at test could be kept identical except for the instructions given to the subject that would make the test either implicit or explicit.

More generally, the two experiments were useful in identifying study procedures and implicit tasks that are
appropriate for further studies. Because implicit tasks have not been used previously in mood dependence studies, tasks had to be found that (a) showed priming over relatively long periods of time, and (b) allowed for self-initiated processing both at study and at test to increase the probability that they would be sensitive to mood context. Clearly, from the results of Experiment 2, the autobiographical study task was sensitive to mood context, at least when paired with a free recall test. The category production task (Experiment 1) and the picture identification task (as modified in Experiment 2) showed significant priming over a 2 day study-test interval. All of these tasks allow the subject to generate the materials with little reliance on external cues. The stem completion task is less likely to be useful in future studies because of the low performance rates after a two day interval.
Footnotes:

1. The automatic process view of mood is exemplified by network activation theory proposed by Bower (1981). By this view, experiencing a mood makes certain memories and information more likely to come to mind. Each distinct emotion has a specific unit connecting it to physiological and informational aspects of that emotion, including descriptions of events from one's life during which that emotion was aroused. When activated above a threshold, the emotion unit transmits excitation throughout the memory structures to which it is connected, thereby increasing the accessibility of associated information and event memories while the emotion is being experienced.

2. While completion baserates were not collected from the present subjects, the same materials had been used in a similar previous study (Eich, personal communication) where baserates were assessed. The obtained baserates did not differ from the Graf and Williams (1987) competition norms.
References


