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BRIEF REPORT

Emotional episodes facilitate word recall

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Dysphoric and nondysphoric college students described self-generated images of themselves interacting with the referents of neutral nouns; the nouns were paired with adjectives that changed their emotional meaning (e.g., *cruise ship, cargo ship, sinking ship*). On the subsequent unexpected test, the nouns from emotional pairings were more frequently recalled than were those from neutral pairings, regardless of their valence or congruence with the students' mood. An examination of the initial descriptions revealed that emotional images were more distinctive, but not in a pattern correlated with recall of the corresponding nouns.

A common belief about memory is that emotional events are better remembered—not the traumatic events that are thought to cause repression, of course, but merely the very pleasant or very unpleasant events of common experience. Indeed, studies of memory for such naturally occurring events seem to provide the strongest evidence for believing in the memorial advantage of emotion (see Christianson & Engelberg, 1999). As researchers commonly acknowledge, however, this kind of evidence is difficult to interpret, because emotional features of real-world events covary with other features. In considering that emotional events are rare, for example, we might wonder whether their distinctiveness instead of their emotional quality underlies the memorial advantage. Considerations such as these have encouraged controlled laboratory investigations.

Laboratory investigations of emotional memory typically control some conditions for processing emotional and nonemotional materials. Just as is true with naturally occurring events, however, experimental materials that differ in their emotional value also differ in other ways. Even the use of single words—personality traits, for example—is subject to these concerns, because we can never be sure that our attempts to control frequency of

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occurrence, associative strength, or numerous other characteristics have been truly successful. Published normative ratings are obtained in contexts that differ from the ones in which we present the materials, for example. And we rarely control for the degree of conceptual coherence among words in the various emotion-related categories. These and similar difficulties have been acknowledged in research on emotion and memory (e.g., Mayer & Bower, 1985, Williams, Watts, MacLeod, & Mathews, 1988).

The experiment in this report takes a step toward inferring a causal role for episode-related emotion in word recall. In brief, we varied the initial episodes for encountering neutral nouns, in order to change their emotional value from neutral to positive or negative (also see Hertel, 2000). A similar approach recently has been reported by Reisberg and Heuer (2000), who studied memory for a series of neutral slides presented against the backdrop of an emotional or nonemotional story. Although both approaches clearly do not eliminate alternative explanations of memory differences (e.g., the distinctiveness of the prior-processing episode), they enjoy certain advantages. The main advantage to the present method lies in its control of the within-valence coherence of the materials. By using the same nouns in all conditions and varying the emotional valence of the initial processing episode, we reduced the viability of intra-valence cueing as a competing explanation of differences associated with emotion.

Concerns with differences in within-valence conceptual coherence have troubled some investigators of mood-congruent recall in depressed states. Greater coherence among negative words that are conceptually associated with depression (e.g., *death, failure, sadness*) might boost otherwise low levels of recall by depressed participants, through a process by which additional items are cued by previously recalled words. Believing that our alternative procedure would reduce intra-valence cueing, we included dysphoric mood as a grouping factor in the design of this experiment.

The pursuit of conceptual bases for mood-congruent recall is important beyond suspicions of a confounding role for conceptual coherence. Mood and one's awareness of mood might serve to organise initial processing and later recall in much the same way as do category names. Some researchers have asked whether the mood or emotional state of the participant is even necessary for obtaining mood-congruent memory effects (e.g., Perrig & Perrig, 1988). This issue has been interpreted as a question of the demand characteristics of laboratory mood studies, but it need not be. Regardless of demand, in studies that employ mood-induction procedures, recall might sometimes be influenced by the conceptual connections between the coherent set of words in each valence category and the materials used in the induction procedure itself (see Parrott & Hertel, 1999). In this regard, Varner and Ellis (1998) developed a ''schema induction'' procedure on the topic of writing essays that was similar to mood induction procedures but involved thoughts of essay writing instead of feelings. Later the students who underwent this procedure produced ''essay-congruent'' recall, similar to the effects of a sadness induction on recall of sadness-related words. Similarly, in studies performed with mood-disordered participants, evidence of mood congruence is frequently restricted to materials that are specifically related to depression and processed in self-referential terms (see Gotlib, Roberts, & Gilboa, 1996). Through such procedures, self-concept can conceptually organise the recall of interrelated items, particularly when participants are aware of the relevance of their emotional state. In short, both types of investigations—induction or natural state—are logically capable of producing mood-congruent recall on the basis of conceptual connections among the materials to be recalled and other aspects

of the method. Our secondary aim was therefore to test the hypothesis of mood-congruent recall while minimising conceptual connections and their potential for differential cueing. If obtained, such evidence should help establish mood-congruent recall as a phenomenon separable from other organisations of meaning (see Bower, 1992). Fundamentally, however, we were interested in establishing the effects of individual emotional episodes, regardless of mood.

METHOD

To manipulate the emotional valence of the materials to be recalled, we first paired neutral nouns with three different adjectives. For example, depending on the participant's assignment to materials, the noun *cottage* appeared in phase 1 as *romantic cottage, stone cottage*, or *gloomy cottage*; the noun *mammal* appeared as *adorable mammal, sleeping mammal,* or *hunted mammal*. Participants were instructed to form an image of each word pair that included themselves, to describe the image in a sentence, and to rate the emotional value of the image. Instructions for self-referential processing were used in order to increase the likelihood of finding mood-congruent recall (see Watkins, Matthews, Williamson, & Fuller, 1992). The rating of emotional value provided a manipulation check.

Participants and design

Trinity University students filled out copies of the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) in the classroom of their introductory psychology course. Blind to the means of selection, students scoring 5 or below (classified as nondysphoric) or 9 and above (classified as dysphoric) were later recruited by phone for the experiment. The term dysphoria is used to convey nondiagnosed negative affect, as measured by such self-report inventories as the BDI. Students with scores ranging from 6 to 8 were not invited to participate, in order to make the two groups more distinct and avoid loss of data from shifting scores on the second administration of the BDI. We set aside the data from participants whose end-of-session BDI scores fell outside the original category ($n = 6$)[1] and replaced them with data from additional participants, in order to preserve counterbalancing.

The final sample included 20 nondysphoric and 20 dysphoric students. In each mood group, four participants were assigned to each of five materials conditions. The first materials condition in each mood group was assigned to three women and one man; the others were each assigned to two women and two men. In each condition, participants encountered positive, neutral, *and* negative word pairs; the emotionality of the episodes varied within subjects.

[1] One participant was an exception. She originally scored 2 but then scored 13 during the experimental session, conducted 3 weeks later. We used her data in the dysphoric condition, due to scarcity of dysophoric participants at the end of the semester.

Materials

Neutral nouns were selected if they contained four to seven letters and were rated less than 4 on a 7-point emotionality scale, between 3 and 5 on a 7-point goodness scale, and greater than 5 on both a 7-point imagery and a 7-point concreteness scale (Paivio, Yuille, & Madigan, 1968; Rubin & Friendly, 1986). Those characteristics, as well as frequency of occurrence (Kuçera & Francis, 1967), were used to balance the five lists of 15 nouns. (Five lists were used in order to develop multiple sets of materials, but only three lists were used for each participant in this experiment.)

Each noun was paired with three adjectives that were chosen to encourage positive, neutral, and negative images when combined individually with the noun (e.g., *cruise ship, cargo ship, sinking ship*). Pilot ratings for the emotional value of images induced by the pairs were also used to balance the five lists of 15 nouns.[2]

Five materials conditions were formed by rotating the five critical lists across positive, neutral, and negative pairings (for positive/neutral/negative assignments, respectively: lists 1/2/3, 2/3/4, 3/4/5, 4/5/1, or 5/1/2). Equal numbers of participants in each mood group were assigned to each rotation scheme.

The list of positive, negative, and neutral pairs for the imaging task in phase 1 was ordered by block randomisation, with two pairs of each valence within each block of six pairs (and one of each in the last block of three pairs). The order of valence position was held constant across the materials conditions. In addition, three buffer pairs, one of each valence, were added to the beginning of the list and three others to the end.

Procedure

Blind to the mood classification of the participants, experimenters described the sessions as a series of different tasks, joined together for convenience. The first task was described as an effort to construct materials to be used in future experiments.

Rating phase. On each trial, participants were asked: (a) to form a mental image of the word pair that included themselves; (b) to make up a short sentence that included the pair and described the image; and (c) to rate the degree and type of emotion associated with the mental image, on a scale of 1 (very positive) to 9 (very negative). Each pair was displayed for 10 s, during which time the participants were asked to construct the image and report the sentence, loudly enough to be recorded on the tape recorder. If, for example, they saw the pair *deserted beach*, they might imagine themselves walking along a deserted beach; with the image in place they should then describe it by saying something like: *I am walking along a deserted beach at dawn.* After 10 s, the pair was replaced with the rating scale, and when the emotion rating was typed the program advanced to the next pair. (These procedures were controlled by Superlab.) The participants were left alone in the room to perform the task, having been assured that someone other than the experimenter would eventually listen to the tape, unattached to their name, for the purpose of classifying the sentences along various dimensions.

[2] A total of 62 students performed the pilot ratings, given instructions identical to those used in phase 1 of the experiment. Each student rated each noun in only one pairing and used a scale ranging from 1 (very positive) to 9 (very negative). The average rating across items was 3.3 for positive, 4.5 for neutral, and 6.7 for negative pairings, $F(2, 148) = 531$, $MS_e = .425$.

Recall test. To reduce recency effects and provide a foil to maintain the cover story regarding unrelated tasks, we next gave the participants an exercise to find as many hidden figures in a series of drawings as they could find within 5 minutes. When the time was up, we asked them to recall nouns (and only the nouns) from the first rating task. When they recalled as many as they could they informed the experimenter, who then told them that ''some people find that it helps to guess at this point, because guessing sometimes turns out to be right. Try hard to recall five more nouns, and guess if it helps you.'' The experimenter drew a line beneath the initially recalled words before asking for the additional words. This forcing procedure was used to counteract the possibility of mood-related response criteria.

Mood forms. The final set of tasks was described as a collection of self-report inventories. Participants filled out copies of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) to indicate present mood state and a BDI to indicate mood state during the past week; they sealed them in an envelope to be passed along, unopened, to the supervising faculty member.

RESULTS

Separate ANOVAs were performed on the percentage of nouns recalled: (a) from the 15 trials from each type of pairing; and (b) from just those trials on which the participants' ratings of emotional valence matched the pre-experimental categories. Additional analyses concerned characteristics of the sentences produced during phase 1. Each analysis included between-subjects factors for gender and mood group (dysphoric or nondysphoric). The within-subjects factor for type of pairing was treated as two planned orthogonal comparisons, one for the effect of emotion (positive and negative vs. neutral) and the other for the type of emotion (positive vs. negative, omitting neutral). The significance level was set at .05 for all analyses.

Percentage recalled from all trials

The first two rows of Table 1 report the mean percentages (out of 15) recalled before participants were asked to recall five additional nouns, and the second two rows report the mean percentages recalled before and after the request. The patterns of results from the two scoring methods were the same and showed that nouns from emotional pairs were recalled more often than were nouns from neutral pairs, regardless of mood group.

The ANOVA performed on the percentage of the 15 nouns in each valence category, recalled before and after recall was forced, revealed a significant effect of emotion (positive and negative vs. neutral), $F(1, 36) = 32.16$, $MS_e = 116.94$, $p < .001$; emotional pairings produced better recall than did neutral pairings. The type of emotion (positive vs. negative) was clearly irrelevant, $F < 1.0$.[3]

[3] All other significant effects involved gender. Although we had no specific interest in gender differences in recall, we report the outcomes for those who might. Women recalled more nouns than did men, particularly when they were dysphoric, as revealed by the significant interaction of mood group and gender, $F(1, 36) = 4.61$, $MS_e = 395.25$. Means were 48% vs. 40%, respectively for women and men in the nondysphoric group, and 53% vs. 29% in the dysphoric group. (Obviously, the main effect of gender was significant.) The gender differences did not appear to be related to mood differences; men and women did not produce significantly different end-of-session BDI scores or PANAS scores, Fs < 1.0.

TABLE 1
Mean percentages of nouns recalled

	Phase 1 pairs		
Mood group	*Positive*	*Neutral*	*Negative*
Free recall			
Nondysphoric	42.0	31.0	40.7
Dysphoric	38.3	31.0	41.3
Total recall			
Nondysphoric	49.7	36.3	46.0
Dysphoric	45.0	33.7	47.3
Adjusted recall			
Nondysphoric	55.8 (9.1)	34.7 (10.4)	43.8 (8.2)
Dysphoric	51.0 (9.2)	25.2 (6.6)	47.2 (9.3)

Note: $n = 20$. Total recall included items recalled after the additional five words were requested. Adjusted recall refers to the percentage recalled out of the number of items that were judged by the participants to be in the same valence category as we had placed them. The mean numbers of items so judged are presented parenthetically.

Percentage recalled from the matching trials

Having found no evidence for mood-congruent recall in the previous analysis, we decided to examine possible differences in the extent to which participants' image ratings corresponded to the experimenter-determined categories, in order to discover whether such differences might have confounded the recall results. We therefore scored the number of ratings in each of the pairing categories that matched the valence of the category. Ratings of 1–3 for positive pairs, 4–6 for neutral pairs, and 7–9 for negative pairs were counted as matching. ANOVA revealed that the difference between emotional trials and neutral trials in the number of matches depended on mood group, $F(1, 36) = 9.26$, $MS_e = 13.17$, $p < .01$.[4] The means are reported in parentheses in Table 1. Dysphoric participants reported neutral images for intended neutral trials much less frequently than did nondysphoric participants, and less frequently than they reported emotional images for intended emotional trials. It seemed advisable, given significant differences of any kind, to rescore recall proportionally to the matching trials alone.

An ANOVA was performed on the percentage of nouns recalled from trials on which the participants' ratings matched our categories. Apart from the main effect of gender (with women recalling more words), the only statistically significant effects involved the type of pairings. As can be seen in the adjusted means in the last two rows of Table 1, the effect of emotion (positive and negative vs. neutral) was significant, $F(1, 36) = 42.96$,

[4] The only other significant effect in the overall analysis was the gender main effect, $F(1, 36) = 6.22$, $MS_e = 7.26$. Women used higher ratings.

MS_e = 222.84; $p < .001$, and replicated the outcomes from the other scoring methods. With this method of scoring, however, the nouns producing positive images were recalled significantly more frequently than those producing negative images, $F(1, 36) = 4.63$, $MS_e = 252.92$, $p < .05$. Although the pattern of means suggested mood-congruent recall, that conclusion was not supported by a significant interaction of mood group with positive versus negative trials, $F(1, 36) = 1.15$, $p < .30$.

Sentence characteristics

The sentences generated by participants to describe their images provided additional information about the manipulation of emotional episodes in phase 1. We constructed three measures: (1) the number of words in each sentence, a crude measure of elaboration; (2) the extent to which the sentence included the self, a measure of self-referential processing; and (3) a distinctiveness rating. Two scorers independently evaluated each sentence, their scores were averaged, and then means were submitted to ANOVAs, with factors for mood group, gender, and the two orthogonal comparisons for type of pairing. The first two measures failed to show significant differences, p-values > .30.[5] Sentences contained an average of 9.4 words, overall, and were rated 2.1 on a 3-point scale of self-referencing.

The measure of event distinctiveness was recorded on a scale of 1 (everyday event) to 5 (infrequent occurrence). Mean ratings (3.0 for positive, 2.6 for neutral, and 3.6 for negative pairs) were higher for emotional pairs than for neutral, $F(1, 34) = 110.89$, $MS_e = .101$, $p < .001$. They were also higher for negative pairs than for positive pairs, $F(1, 34) = 51.86$, $MS_e = .104$, $p < .001$.

Separate imagery ratings

Subsequent to this experiment, we collected ratings concerning the images generated for the 75 nouns in each of the three pairings. Participants ($N = 36$) rated 25 nouns in positive pairing, 25 in neutral, and 25 in negative; the set of 25 was counterbalanced with valence of the pairing across participants (from a similar pool of students at Trinity University). They were given instructions from the first phase of the recall experiment, except that instead of emotional value they rated the vividness of the image (from a value of 1 for very blurry to 9 for very vivid) and then the ease with which it was formed (from a value of 1 for very difficult to 9 for very easy). The mean correlation between the two ratings, calculated across items for each participant, was .74, which was significantly different from 1.0, $t(35) = 7.38$, $p < .001$. Thus, the participants did not generally respond as if the two measures tapped the same characteristic.

The ratings on each scale were averaged across items within the type of pairing, and these means for each participant were submitted to a repeated-measures analysis of variance. The main effect of valence of the pairing was statistically significant for both vividness ratings, ($F(2, 70) = 33.24$, $MS_e = .296$, $p < .001$) and ratings of ease of producing an image, ($F(2, 70) = 29.29$, $MS_e = .327$, $p < .001$). Negative pairings produced lower ratings of both vividness (5.6) and ease (5.7) than did positive (6.5 for vividness and 6.6 for ease) and neutral pairings (6.6 for both).

[5] For all these sentence measures, the tapes from two male participants (one in each mood group) could not be evaluated, due to low volume.

Mood measures

The average score on the BDI in the dysphoric group was 17, which indicates a level of self-reported depressed mood that is typical or perhaps slightly higher than what is typical for studies performed with dysphoric students. (The mean BDI score in the nondysphoric group was 3.) The PANAS was administered in addition to the BDI in order to measure momentary affect, both positive and negative dimensions. ANOVA performed on the scores revealed a significant interaction of dimension with mood group, $F(1, 38) = 29.51$, $MS_e = 42.83$, $p < .001$. Dysphoric participants scored lower than nondysphoric participants on the positive scale ($M = 28$ vs. 35) and higher on the negative scale ($M = 26$ vs. 18).

DISCUSSION

Our results demonstrate that individual emotional episodes facilitate word recall. The episodes were created as self-referential images by the participants themselves; the images were invoked by the adjective that accompanied each noun and that changed its emotional meaning. When the valence of the pair was established purely on the basis of pilot ratings, both positive and negative episodes produced higher levels of noun recall than did neutral episodes. When the valence was defined in terms of the participants' agreement with our categories, an additional difference obtained: Positive episodes produced better recall than did negative episodes.

The pattern of means suggests that the positive (vs. negative) bias was particularly strong for nondysphoric participants, in line with Matt, Vazquez, and Campbell's (1992) meta-analysis, but the interaction did not approach significance. Although low power for detecting this interaction should certainly be suspected, we cannot put too much stock in any analysis that produces differential percentages when the denominators vary to the degree observed in this study. In particular, the dysphoric participants less frequently used the mid-range of the scale in reporting the emotional value of their images. Yet, the patterns obtained from both scoring methods do suggest that mood congruence might be found by pursuing variations on this method of constructing processing episodes.

The main result, once again, was the facilitative effect of emotional images, compared to neutral images. Clearly, it is important to consider the nature of these images. First (with apologies to Gertrude Stein), a rose is not a rose is not a rose. A wilted rose in a corsage found at the scene of a fatal car accident is perhaps a very different rose than the small rose in the vase on the lunch counter or the first dewy rose of spring in the garden of one's childhood. And the way that one comes to remember the word *rose* should at least partly correspond to those differences.

In order to obtain additional information about the processing basis for the advantages of emotional episodes, we took several measures of the image descriptions generated for the paired items. Although their descriptions did not differ in length or degree of self-involvement, with respect to any of our factors, our measures were crude. Perhaps the emotional images were more elaborate or involved the self in ways we did not measure. We do know that the negative pairings produced the most distinctive (or rarely occurring) episodes, and there is good reason to believe both that emotional contexts should be distinctive (see Eich & Schooler, 2000; Heuer & Reisberg, 1992) and that distinctive events are better recalled (see Hunt & McDaniel, 1993). In our results, however, distinctiveness was not significantly correlated with recall. The negative pairs produced

higher mean distinctiveness ratings, but the positive pairs produced a higher percentage recalled (according to the proportional analysis only). Also worth noting were the null findings that distinctiveness ratings were not significantly correlated with any measure of recall, computed both within the valence categories and by collapsing across them. Moreover, compared to the positive and neutral pairings, the negative pairings were judged (by other students in a separate experiment) to produce less vivid images and to produce them less easily. Thus, we know that the emotional episodes facilitate recall in ways that are not easily understood by the imagery measures we recorded. Nevertheless, we think the main findings are important. Why?

The results demonstrate that the degree of emotion inherent in individual processing episodes can affect the probability of recall. This item-specific form of our manipulation contrasts with more global means of varying emotion while holding constant the nominal events to be recalled (e.g., nonverbal communication in Hertel & Narvaez, 1986, story narrative in Reisberg & Heuer, 2000). In all of these methods of varying the emotional quality of the episode, the functional stimulus no doubt changes along with the valence, but probably not to the degree that characterises the use of different categories of emotional and neutral words. Moreover, our method reduces the role played by differential conceptual coherence across the categories of emotional and neutral words. A *sinking ship* might well be a different ship from a *cruise ship*, but the conceptual coherence among *sinking ship, racist poster,* and *pathetic king* is likely to be similar to the coherence among *cruise ship, humorous poster,* and *noble king,* or among *cargo ship, laminated poster,* and *reigning king.* As a matter for further research, we recommend such control as one way of pursuing issues of emotional memory and mood-congruent memory.

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