

Mood-Congruent Recall in Autobiographically Induced Emotional States

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Abstract

This study examined mood-congruent recall of emotionally valenced words using a written autobiographical mood-induction procedure (MIP). The mood-congruent recall hypothesis predicts that participants in a negative mood will recall more negative words and fewer positive words than those in a positive mood. This hypothesis has been supported using a variety of MIPs, such as hypnosis, reading emotional statements, and listening to emotional music.¹ However, these methods are limited by a lack of direct personal relevance, and may be susceptible to demand effects.² The present study sought to reduce these limitations by using a written autobiographical MIP, adapted from Gino, Brooks, and Schweitzer's anxiety-induction method,³ to induce overjoyed and depressed emotional states. This study consisted of two separate experiments involving 84 and 77 participants, respectively. Experiment 1 measured the effect of the MIP on positive and negative emotions. Participants were asked to write about an experience that made them feel either overjoyed or depressed. They then completed the PANAS-X, a self-report mood scale.⁴ Results show that the MIP is effective: Participants in the depressed condition experienced stronger negative and weaker positive emotions than those in the overjoyed group. In Experiment 2, recall of emotionally valenced words was measured as a function of mood. After completing the MIP, participants were shown a series of 30 words, 15 positively valenced and 15 negatively valenced. Following a brief distraction task, participants were asked to write down as many of the words as they could remember. Consistent with the mood-congruent recall hypothesis, results indicate that subjects in the depressed condition recalled more negative and fewer positive words than those in the overjoyed condition.

Keywords: Memory, Emotional States, Mood Induction

1. Introduction

The effects of emotion on cognition, and on memory in particular, have been the subject of extensive study for many years. Much of the previous research on the relationship between emotion and memory has been based on the network theory of affect.⁵ According to this theory, there exists a neural connection between emotion-processing nodes and cognitive processing regions of the brain, such that the activation of a particular emotion by some thought or experience can automatically prime other cognitive functions to be activated in a corresponding way. Among the hypotheses derived from the network theory is that of mood-congruent recall, which predicts that the encoding and retrieval of affectively valenced stimuli will be biased toward stimuli that correspond to one's emotional state, and that such stimuli will therefore be remembered better than stimuli that do not correspond to one's emotional state.

Studies that provide the most direct support for both mood-congruence and the network theory generally involve the induction of an emotional state using a stimulus in one domain, and the subsequent observation of mood-congruent recall of stimuli in another domain. For example, emotional states induced through hypnosis have resulted

in mood-congruent recall of elements of a story.⁶ Moods induced by pleasant or unpleasant odors produced congruence in the emotional nature of subjects' episodic memories.⁷ Others have even demonstrated expression-congruent recall by instructing participants to smile or frown while reading either joyful stories or angry editorials.⁸

Despite this large body of converging evidence, there remain a number of concerns, particularly regarding the ecological validity of certain methods. In natural settings, both the sources of emotional states and the information being remembered tend to be personally relevant, as opposed to the contrived mood-induction methods and memory stimuli used in most laboratory research.⁹ A number of attempts to improve the ecological validity of memory stimuli have used self-referent measures of memory in place of the more common measures involving lists of emotionally valenced words. For example, some researchers have asked subjects to write about events from their past, and then measured the emotional content of those stories.¹⁰ Findings of mood-congruence have been fairly consistent across a variety of memory stimuli, and therefore the verbal memory tasks typically seen in mood-congruent recall studies should not be a major concern.

The other side of the ecological validity issue—the source of emotional states—has been less thoroughly addressed. One of the most frequently used mood induction methods is the Velten task, in which participants are directly asked to try to achieve a certain mood while reading statements that are consistent with that mood; other studies have made a similarly explicit request for subjects to experience a desired mood while listening to an upbeat or depressing recording of classical music.¹¹⁻¹³ Besides the lack of direct personal relevance in these induction methods, there is some evidence that such techniques may be susceptible to demand effects.¹⁴

Due to the artificial nature of many induction methods, some researchers have sought to test the mood-congruence effect through a differential method by studying preexisting emotional states. These studies often fail to find a significant effect of mood on recall.¹⁵⁻¹⁶ There are a number of problems associated with such an approach. Generally speaking, the natural emotional states of a sample of undergraduate students will be relatively neutral, and although it has been demonstrated that stronger induced moods do not necessarily result in a greater mood-congruent effect than do weaker induced moods, there still appears to be a threshold for mood intensity below which congruent recall does not occur.¹⁷ In addition, Hasher et al. used scores on a depression scale in order to divide subjects into groups by mood state;¹⁸ others have looked for differences in recall of emotionally valenced stimuli between clinically depressed and healthy subjects.¹⁹ Due to the multifaceted nature of depression, it seems unlikely that emotional state was the sole difference between the groups in these studies, so any causal claims based on the results of such methods are necessarily weak.

Rusting attempted to challenge the network theory's explanation of mood-congruent recall by proposing and testing a model in which the effects of emotional state are moderated by certain stable personality traits.²⁰ In Study 1, Rusting measured participants' preexisting moods, along with several personality traits, while in Study 2 emotional state was induced using a combination of the Velten task and listening to emotional music. Personality traits predicted memory performance independent of mood in Study 1, but the reverse was found in Study 2. These findings seem to suggest that, although stable personality traits may moderate the effects of mild moods on recall, stronger emotional states predict memory performance regardless of stable personality traits. Thus, using induced rather than natural moods not only controls for individual differences through random assignment, but it also seems to minimize the effects of stable personality traits.

There is an alternative induction technique that avoids the limitations of preexisting moods, as well as those of artificial induction methods. Autobiographical mood induction involves asking participants to reflect on a situation from their past in which they experienced a certain mood. Since natural moods generally occur in response to life events, autobiographical induction should produce more realistic emotional states than other induction methods, while still insuring that participants' moods surpass the requisite threshold for mood-congruence. Brewer, Doughtie, and Lubin found that having subjects close their eyes and recall positive or negative events produced stronger positive and negative emotions than the Velten task, without making an explicit request for subjects to experience those emotions.²¹ However, this procedure relied on the use of audio recordings to provide instructions and guidance, such that all subjects in a group would have to be induced with the same mood. The Velten task thus retained the advantage of allowing researchers to induce multiple moods simultaneously within a group, thereby increasing their control.

In a more recent study, subjects received written instructions to write about an anxiety-invoking experience.²² This method effectively induced strong feelings of anxiety, while eliminating the need for auditory instructions before, or guidance during, reflection. Thus, a written autobiographical mood-induction procedure can be used to induce personally relevant moods with reduced demand effects and greater control relative to the more traditional methods.

The present study sought to replicate previous findings of mood-congruent recall while improving upon the ecological validity of existing research. Toward this end, two experiments were conducted using a written autobiographical mood-induction procedure to induce depressed and overjoyed emotional states. Experiment 1

investigated the efficacy of this method by measuring participants' post-induction emotions. It was predicted that participants in the depressed mood condition would experience stronger negative and weaker positive emotions than those in the overjoyed condition. Experiment 2 tested the mood-congruent recall hypothesis by examining the effects of the mood-induction procedure on participants' free recall of positively and negatively valenced words. Consistent with previous studies,²³⁻²⁶ it was predicted that participants in the depressed condition would recall more negative words and fewer positive words than those in the overjoyed condition.

2. Experiment 1

2.1 Methodology

2.1.1 participants

Experiment 1 involved 84 undergraduate students (60 females, 24 males), ranging in age from 18 to 23 ($M = 18.8$). Participants were recruited from introductory psychology courses at a college in the Midwestern United States. They received course credit for participating.

2.1.2 materials

Experiment sessions were conducted in quiet classrooms, with participants seated at desks arranged in rows. Each participant received a six-page, single-sided packet, which provided instructions for each task in the study, as well as spaces on which to record their responses using their own pencils or pens. IBM SPSS Statistics software was used for data analysis.

The mood-induction task used in this study was adapted from the anxiety-induction procedure used by Gino et al.²⁷ Participants in the depressed condition received the following instructions:

Please take the next 4 minutes to answer the following question as truthfully as possible. Your response will be completely confidential. Please describe, as best you can, a situation you experienced in the past that made you feel *depressed*. You might begin by writing down a description of your feelings at the time. Then write about the details of the situation.

Please write in complete sentences. And, if you can, try to write your description so that someone reading it might be able to understand the feelings you had. Please use the full time to add detail to your description.

The instructions in the overjoyed condition were identical, except that the word *depressed* was replaced with *overjoyed*. Below the instructions were lines on which participants were to write about the experience that they chose. These lines were continued onto the second page of the packet.

Two mood measures were used in this experiment. The first of these was the expanded form of the Positive and Negative Affect Schedule (PANAS-X), a 60-item self-report mood scale.²⁸ The items of this scale fall under several categories, including four negative emotion scales (fear, hostility, guilt, and sadness) and three positive emotion scales (joviality, self-assurance, and attentiveness). For each item, participants rated the extent to which they felt that way using a 5-point scale (1 = *very slightly or not at all*, 5 = *extremely*). Since this experiment sought to measure participants' temporary emotional states, participants were asked to indicate how they felt "right now—that is, at the present moment".²⁹ The second mood measure was a single-item mood scale, which simply asked participants to rate their current mood from 1 (*very sad*) to 7 (*very happy*).

2.1.3 design and procedure

Experiment 1 used a between-subjects design to examine the effects of a written autobiographical mood-induction procedure on participants' moods. Specifically, self-reported positive and negative emotional states were compared between participants who were randomly assigned to either an overjoyed ($n = 41$) or depressed ($n = 43$) mood condition.

Each experiment session was conducted with groups of no more than 20 participants at a time. At the beginning of each session, participants signed informed consent forms, which described the experiment as a study of memory and emotion. After collecting these forms, the experimenters distributed the experiment packets facedown.

Once all participants had received packets, they were asked to turn them over and read the instructions for Phase 1, which was the mood-induction task. Participants were given 4 min to complete this task, and were asked not to continue to the next phase until instructed to do so by the experimenters. Participants were then instructed to turn the page and complete Phases 2 and 3, which were the PANAS-X and the single-item mood scale, respectively. Participants had 5 min to complete both phases, and they were asked not to continue to Phase 4 until instructed to do so.

Phase 4 was intended to insure that induced negative emotions did not persist beyond the needs of the experiment. Instructions for this phase were the same as those from Phase 1, except that participants in both conditions were asked to write about a humorous experience from their past, rather than a depressing or joyful one. After a 4-min writing period, the experimenters collected the packets and debriefed the participants.

2.2 data

On the PANAS-X, participants in the depressed condition scored higher on negative items and lower on positive items than those in the overjoyed condition. Of the four negative and three positive subscales, the most directly relevant to this study were Sadness and Joviality. Sadness scores in the depressed condition ($M = 9.9$, $SD = 4.9$) were higher than those in the overjoyed condition ($M = 6.5$, $SD = 2.5$). An independent-samples t test indicated that this difference was significant, $t(82) = 3.94$, $p < .001$. On Joviality items, depressed participants scored significantly lower ($M = 18.6$, $SD = 8.2$) than overjoyed participants ($M = 25.7$, $SD = 8.03$), $t(82) = 4.04$, $p < .001$.

In addition to these key subscales, depressed and overjoyed participants' scores differed in the expected direction on each of the other negative and positive subscales. All four negative subscales showed significant differences at the $p < .05$ level; of the three positive subscales, however, differences were significant for Joviality and marginally significant for Self-assurance ($p = .060$), but not for Attentiveness ($p = .142$).

Table 1. scores on PANAS-X positive and negative subscales by mood condition

PANAS-X Subscale	Overjoyed ($n = 41$)		Depressed ($n = 43$)	
	M	SD	M	SD
Fear	8.8	3.6	10.5*	3.9
Hostility	7.3	2.4	10.5***	4.1
Guilt	7.2	2.8	10.1**	5.2
Sadness	6.5	2.5	9.9***	4.9
Joviality	25.7	8.0	18.6***	8.2
Self-assurance	16.6	6.0	14.2 [†]	5.4
Attentiveness	13.1	3.3	12.0	3.5

Note. Subscales have varying numbers of items, so scores cannot be compared between them.

[†] $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

In addition, scores on the single-item scale in Phase 3 were significantly lower in the depressed condition ($M = 4.6$, $SD = 1.2$) than in the overjoyed condition ($M = 5.3$, $SD = 1.1$), $t(82) = 2.76$, $p = .007$. In combination with the PANAS-X scores, these data suggest that the written autobiographical mood-induction procedure used in this study effectively induced both positive and negative emotional states.

3. Experiment 2

3.1 Methodology

3.1.1 participants

Experiment 2 involved 77 undergraduate students (43 females, 34 males), ranging in age from 18 to 26 ($M = 18.8$). As in Experiment 1, participants were recruited from introductory psychology courses at a college in the Midwestern United States. They received course credit for participating.

3.1.2 materials

Participants received six-page, single-sided packets, similar to those used in Experiment 1. In addition, a Microsoft PowerPoint slideshow was used to present a list of words that participants were instructed to remember. This slideshow was displayed using a ceiling-mounted projector and screen.

A set of 30 words (15 positive, 15 negative) was selected from a 140-word list used by Tse and Altarriba.³⁰ Using the Affective Norms for English Words manual (ANEW),³¹ the strongest positive and negative words were identified by eliminating those with mean valence ratings of less than 2 points above or below 5, which is the neutral midpoint between *completely unhappy* and *completely happy* on their 9-point scale. Frequency ratings were then obtained for the remaining words, and only those with frequencies between 1 and 2 standard deviations above the mean were retained.³² From the resulting list of strongly valenced and relatively—but not extremely—common words, 15 positive and 15 negative words were randomly selected to use in this experiment. These words were then randomly sorted into a single list. Independent-samples *t* tests showed no significant differences in valence, frequency, length, or number of syllables between the positive and negative words.

Table 2. valence ratings, frequency, length, and number of syllables by word type

Word Type	Valence		Frequency		Length		Syllables	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Positive	7.5	0.4	9.7	0.7	5.1	0.9	1.5	0.6
Negative	2.3	0.4	9.5	0.6	5.1	0.8	1.7	0.5

Note. Valence is based on mean valence ratings on a 9-point scale from the ANEW manual.³³ Frequency refers to log-transformed Hyperspace Analogue to Language (HAL) frequency norms, obtained from Balota et al.'s English Lexicon Project.³⁴

3.1.3 design and procedure

Experiment 2 used a 2 x 2 (Mood x Word Valence) factorial design to examine the effects of depressed and overjoyed moods on memory of positively and negatively valenced words. The informed consent form described this experiment as a series of unrelated tasks involving episodic, verbal, and numerical memory. Experiment sessions were conducted with groups of no more than 20 participants at a time.

Phase 1 was identical to Phase 1 in Experiment 1. In Phase 2, participants were shown a series of 30 words, one at a time, for 3 s each. The words were displayed on a screen at the front of the room. Participants were told in advance that there would be a memory test on these words later in the experiment. Following the presentation of the 30 words, participants were asked to turn to the next page in their packets for Phase 3. This phase was a distraction task in which a randomly ordered series of seven numbers was displayed on the screen at the front of the room, one at a time, for 1 s each. After the seventh number, participants were given 10 s to record the numbers, in order, on their packets. This task was repeated a total of four times.

After recording the numbers from the fourth series, participants were asked to turn to the next page in their packets for Phase 4, the free recall task. This page contained blank lines on which participants were told to write as many of

the words from Phase 2 as they could remember. Participants were given 5 min to complete this task, and were asked not to continue to the next phase until instructed to do so. Phase 5 was identical to Phase 4 in Experiment 1.

3.2 data

Memory tests from Phase 4 were scored to determine the proportion of negative and positive words correctly recalled. The mean proportion of negative words recalled was .349 ($SD = .133$) in the depressed condition and .344 ($SD = .144$) in the overjoyed condition. The mean proportion of positive words recalled was .294 ($SD = .134$) in the depressed condition and .368 ($SD = .145$) in the overjoyed condition. There was a greater difference in recall of positive words than in that of negative words, as can be seen in Figure 1.

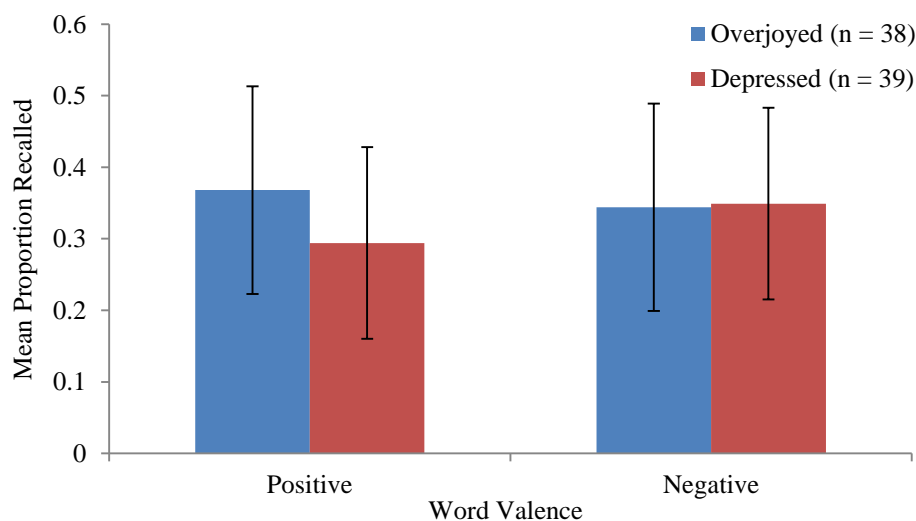


Figure 1. Mean proportion of positive and negative words recalled in overjoyed and depressed conditions. Error bars represent standard deviations.

A 2 x 2 repeated measures ANOVA found no significant main effects for mood or word valence. This indicates that overall memory was not better in one mood condition than in the other, and that one type of word was not remembered better than the other overall. However, a significant Mood x Word Valence interaction was found, $F(1, 75) = 5.60, p = .021$. Participants in the depressed condition recalled more negative words and fewer positive words than those in the overjoyed condition.

4. Conclusion

This study examined the effects of autobiographically induced moods on free recall of emotionally valenced words. In Experiment 1, it was predicted that individuals who wrote about emotional events from their past would subsequently experience emotional states that corresponded to those events. In Experiment 2, it was predicted that individuals would be better able to recall words that were congruent with their emotional state.

Consistent with the first hypothesis, the results from Experiment 1 demonstrate that a written autobiographical mood-induction procedure effectively induces both positive and negative moods. Specifically, the results indicate that individuals who write about depressing past events experience stronger negative emotions and weaker positive emotions than those who write about joyful past events. Besides producing clear differences in the most directly relevant emotions—sadness and joviality—the effects of this procedure seem to generalize to other negative emotions—fear, hostility, and guilt—but less so to other positive emotions.

In support of the second prediction, the results of Experiment 2 indicate that individuals in a depressed mood recall more negative words and fewer positive words than individuals in an overjoyed mood. This finding suggests that memory is biased toward information that corresponds to one's current emotional state, as the mood-congruent recall hypothesis predicts.

A key contribution of the present study is the application of a written autobiographical mood-induction procedure. This technique utilizes a more personally relevant procedure than many previously used methods, thus allowing for greater generalizability to natural settings. Since no overt instruction to experience the desired mood is necessary, this method also minimizes potential demand characteristics. By conceptually replicating previous findings while using an autobiographical mood-induction method, this study provides further support for the network theory of affect and its derivative hypothesis of mood-congruent recall.

In order to further examine the effects of this mood-induction procedure, future research may benefit from examining the emotional content of the stories written by participants during the mood-induction stage. Some studies of mood-congruence have measured the affective valence of stories recalled by participants after a different induction method; for example, at the end of their study, Ehrlichman and Halpern asked subjects to rate the happiness or unhappiness of their own written memories.³⁵ Alternatively, participants' stories might be analyzed by independent raters who are unaware of the research question. The level of emotional content in participants' stories could be compared to the strength of their induced moods, and to their degree of mood-congruent recall. If story content predicts recall bias, but not mood strength, it may indicate that some demand effect is still involved.

Including both a neutral mood condition and neutral words in the design might also be useful in a future study. Gino et al.,³⁶ whose anxiety-induction method was adapted to induce depressed and overjoyed moods in this study, used the same technique in a neutral mood condition by asking participants to describe their typical evening activities. The addition of a control group, along with neutral memory stimuli, could help to determine the direction of mood's effect on memory—that is, whether mood facilitates recall of congruent stimuli, or inhibits recall of incongruent stimuli.

The present study demonstrates mood-congruent recall of emotionally valenced words through a written autobiographical mood-induction procedure. By using a more personally relevant mood stimulus, this finding enhances the ecological validity of previous mood-congruence research, and thus contributes to the substantial body of literature in support of the network theory of affect.

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