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Mood congruent memory in Dysphoria: The roles of state affect and cognitive style

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Abstract

Biases in incidental memory for self-referent adjectives and intentional memory were compared across nondysphoric (ND; $n = 48$), experimentally induced dysphoric (EXP; $n = 49$), and naturally dysphoric (NAT; $n = 48$) individuals. Negative biases, "evenhandedness", and positive biases were demonstrated among NAT, EXP and ND participants, respectively, in terms of incidental memory. Correlation analyses suggested that the effects of cognitive style (self-esteem, dysfunctional attitudes, and attributional style) are limited to negative stimuli. Memory for incidental positive stimuli was only predicted by state affect. Groups did not differ in performance on an intentional memory task. Implications for network and schema models of depression are explored.

Keywords: Memory bias; Depression; Affect; Cognitive style; Mood congruency

Introduction

Mood congruent recall has been demonstrated in a number of studies investigating memory processes in dysphoria. Whereas nondysphoric individuals tend to recall more positive than negative experimentally presented stimuli, dysphoric and depressed individuals tend to recall either approximately equal proportions of positive and negative stimuli, or more negative than positive stimuli (see Blaney, 1986; Matt, Vasquez, & Campbell, 1992 for reviews). This effect is typically more pronounced for self rated items (e.g., Does this word describe you?) versus semantically rated items (e.g., Does this word have a specific meaning or relate to a specific situation?). As an example, Gilboa, Roberts, and Gotlib (1997) found that mildly depressed individuals demonstrated an evenhanded recall of positive and negative valenced stimuli that were previously rated in terms of whether they described the participants' personality, whereas nondepressed individuals demonstrated a positive recall bias following the same rating task. A number of other studies have reported similar findings with depressed and dysphoric individuals (Bradley & Mathews, 1983; Breslow, Kocsis, & Belkin, 1981; Mathews & Bradley, 1983). Nonetheless, findings have not been entirely consistent across the

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literature (for example see Bradley, Mogg & Williams, 1994; Ilsley, Moffoot, & O'Carroll, 1995 for failures to demonstrate mood congruent effects with measures of explicit memory).

One recent review suggests that greater attention to both stable characteristics of the person *and* transient mood states might help explain variability in mood-congruency effects (Rusting, 1998), and in this regard distinctions between the basic premises of Beck's schema model and Bower's network model are relevant. Beck (1967, 1976) suggests that negative schemata in depression bias all aspects of information processing, including memory. Schemata consist of organized elements of past reactions and experiences that form a relatively cohesive and persistent body of knowledge capable of guiding subsequent perceptions and appraisals (Segal, 1988). In the case of a nondepressed person, schemata may consist of such constructs as competence, attractiveness, and mastery, whereas in the case of a depressed person schemata may consist of constructs such as failure, inadequacy and despair. These schemata would facilitate elaborative processing of thematically congruent stimuli, leading to biases in recall of positively valenced stimuli among nondepressed individuals and biases in recall of negatively valenced stimuli among depressed individuals. Presumably, the effects of these stable cognitive schemata would have a greater impact on memory for valenced stimuli compared to the effects of transient mood states on memory.

Bower's (1981, 1987) associative network model of mood and memory posits that there are pathways between mental nodes representing propositions, concepts and emotions. "Emotion nodes" can be linked to a number of related nodes involving semantic content. For example, an individual's sadness node might be linked to other nodes representing concepts such as "failure", "loser" and "incompetent." As a result of spreading activation, the experience of sadness would lead to increased activation of each of these related nodes. This heightened activation of concepts linked to the sadness node would lead to enhanced memory for mood congruent stimuli compared to mood incongruent stimuli. In other words, material that is congruent with an individual's mood, either at the time of storage or retrieval, will be better recalled than material that is incongruent with an individual's mood. Consequently, Bower's model suggests that both naturally occurring subclinical depressive symptoms *and* transient dysphoric mood states have similar effects on memory for valenced stimuli.

Beyond the issue of the general impact of transient mood states on memory, a number of additional issues remain unresolved. First, while memory involves multiple components and processes, it is uncertain which of these are affected by depression and transient dysphoric mood states. The majority of research has investigated incidental recall in which participants are given a "surprise" memory test of words that were previously read. Studies that have focused on intentional recall have yielded less consistent results (e.g., Gilboa et al., 1997). It is possible that depressed individuals are able to override cognitive biases when they explicitly rehearse material for later testing. If so, it is likely that this type of override would be more probable among individuals with transient dysphoric mood states than among individuals with more long-standing and serious experiences with depressive symptoms. Second, it is unclear whether memory biases associated with depression are primarily the result of enhanced recall of negatively valenced stimuli or deficits in the recall of positively valenced stimuli or both. This issue has bearing on the theoretical question of whether depression is associated with the facilitated processing of negative information or the impaired processing of positive information (see Allen, Woolfolk, Gara, & Apter, 1996; Kuiper, Olinger, & Swallow, 1987; Woolfolk, Noalany, Gara, Allen, & Polino, 1995). It is also possible that transient mood states and more persistent depressotypic characteristics (e.g., negative schemata) have different effects on the processing of positive versus negative information. Finally, little work has investigated the potential contribution of negative cognitive style to mood congruent biases. Beck's (1967, 1976) schema model suggests that these memory biases result from deeply ingrained dysfunctional beliefs. Consequently, this model predicts that memory biases should be associated with negative cognitive styles. Consistent with this hypothesis, Alloy, Abramson, Murray, Whitehouse, and Hogan (1997) found that nondepressed individuals who had been selected by virtue of having both negative attributional styles *and* high levels of dysfunctional attitudes exhibited negative memory biases relative to those with low scores on both of these measures. Likewise, a series of three recent studies suggests that lower self-competence and lower self-liking are associated with enhanced memory for failure-related and negative social content words (Tafarodi, Marshall & Milne, 2003).

The present study was designed to determine: (1) the extent to which memory disturbances resulting from experimentally manipulated dysphoric mood resemble those associated with naturally occurring depressive symptoms; (2) if dysphoria has greater effects on memory for positive versus negative stimuli; (3) if dysphoria is associated with disturbances in both incidental and intentional memory; and (4) the degree to which mood state, depressotypic cognitions, such as negative attributional style, dysfunctional attitudes, and low self-esteem, are associated with memory for positive and negative words.

Method

Participants

Participants were recruited through mass testing sessions in introductory psychology classes. Individuals scoring $\geqslant 1$ and $\leqslant 5$, or $\geqslant 15$ on the Beck Depression Inventory (BDI) were selected for the study. On the day of the study, participants again completed the BDI. Participants whose depression status changed since the initial BDI assessment did not participate further in the study ($n = 55$). This procedure helped insure that participants had relatively stable levels of either high or low symptomatology. The final sample was comprised of 146 college students with a mean age of 19.0 years ($SD = 3.5$).

Randomization took place after completion of the BDI on the day of the experiment. Participants who scored 15 or above on the BDI were assigned to the naturally dysphoric group (BDI $M = 20.5$), while those who scored 1–5 on the BDI were randomized to the experimentally induced dysphoric group (BDI $M = 2.6$) or the nondysphoric group (BDI $M = 2.8$).[1] The naturally dysphoric (NAT) group ($n = 48$, 62% female) received a neutral mood induction whereas the experimentally induced dysphoric (EXP) group ($n = 48$, 67% female) and the nondysphoric (ND) group ($n = 50$, 56% female) received a negative or neutral mood induction, respectively.

Measures

Participant selection

Beck Depression Inventory (BDI). The BDI was used to classify participants as mildly depressed (score 15 or greater) or nondepressed (score 1–5). The 21-item BDI is a widely used and extensively researched self-report instrument for assessing the severity of depressive symptomatology in both psychiatric and normal populations (Beck, Steer, & Garbin, 1988).

Mood rating

Mood Visual Analog Scales (MVASs). Seven MVASs were used: 'sad,' 'frustrating,' 'anxious,' 'happy,' 'hopeful,' 'cheerful,' and 'overall mood.' The first six scales were rated from *not at all* (coded as intensity rating of 0) to *extremely* (coded as intensity rating of 100). The overall mood scale was rated from *extremely negative* (coded as intensity rating of -50) to *extremely positive* (coded as intensity rating of $+50$).

Cognitive style

Attributional Style Questionnaire (ASQ). The ASQ (Peterson et al., 1979) asks participants to imagine themselves in each of 12 situations (six with desirable outcomes and six with undesirable outcomes). They then write down the major cause of the event and rate the attributed cause for its perceived internality, stability, and globality on a 7-point scale. Consistent with recommendations from Hopelessness Theory (Abramson, Metalsky, & Alloy, 1989), global and stable ratings for undesirable outcomes were summed to provide a measure of attributional style.

Rosenberg Self-Esteem Scale (RSE). The RSE (Rosenberg, 1965) is a widely used measure of global self-esteem. The scale consists of 10 statements that individuals rate from strongly agree to strongly disagree, using a 1–5 Likert type scale.

[1]Of the 146 participants, 74 did not participate in mass testing and were therefore recruited at the time of the study. Fifteen were assigned to the depression group based on BDI scores of 15 or greater, 28 were randomized to the EXP group, and 31 to the N-NAT group.

Dysfunctional Attitude Scale (DAS). The DAS (Weissman & Beck, 1978) is a self-report inventory derived from Beck's (1976) cognitive model of depression designed to measure depressogenic schemata. This 40-item inventory asks individuals to indicate their level of agreement with statements describing contingencies required to maintain feelings of self-worth, as well as more general negative attitudes about the self.

Memory Stimuli

Incidental memory stimuli. Participants indicated whether or not a series of 42 trait adjectives were self-descriptive. These adjectives were identical to those used by Gilboa et al. (1997) in their incidental memory task, and previously had been used by Pratto and Oliver (1991). Twenty-one adjectives were negative in valence (e.g., '*doomed*,' '*useless*,' and '*gloomy*'), whereas 21 were positive (e.g., '*confident*,' '*delighted*,' and '*fortunate*'). Pratto and Oliver had selected these words from the Big Five Domains of Personality, and determined that positive and negative adjectives were highly distinct in terms of social desirability. These words were individually presented on a computer monitor for 2000 ms. in a random order generated individually for each participant. Participants were not told that they would need to recall these words until after they had been presented.

Intentional memory stimuli. The intentional memory task included 21 positively valenced words, such as 'fitness,' 'safety,' 'approval' and 'stamina,' and 21 negatively valenced words, such as 'accident,' 'funeral,' 'ulcer,' and 'hateful.' As in the incidental memory task, words were individually presented for 2000 ms. in a random order generated individually for each participant. Prior to the presentation of these stimuli, participants were instructed that they should try to memorize these words. Pilot data from 48 college students (who did not overlap with participants in the main study) suggested that positive and negative words were clearly perceived as differing in terms of valence, $t(47) = 30.36$, $p < .001$, but were similar in terms of degree of emotionality, $t(46) = 1.60$, $p = .12$, and imagery (how much the words represented a mental image or picture), $t(43) = 1.65$, $p = .11$.

Procedure

Mood induction and mood assessment

Baseline mood assessment. In order to establish a baseline level of mood, all participants completed the seven MVASs at the beginning of the study.

Neutral and negative mood inductions. Participants underwent a modified version of the Velten Mood Induction Procedure (Velten, 1967). Instructions and mood induction statements were presented on a video display terminal. Instructions requested that participants try to feel the mood suggested by the statements, that they could do this, and that there was nothing to worry about. The negative mood induction involved 40 statements that gradually progressed from relatively neutral to more depressive in tone. The neutral mood induction consisted of 40 statements that remained neutral and were not self-referent. Each mood induction statement was presented on the display for a period of 15 s.

Mood manipulation check. Following the MIP, participants again completed the MVASs. These ratings were used to assess the effectiveness of the mood manipulation.

Incidental recall

Self-evaluation judgment task. During the judgment task, participants were instructed to decide as quickly as possible whether or not words displayed on the computer screen were self-descriptive. They indicated their decision by pressing either the "Yes" or "No" keys (marked by appropriate labels) on a response box connected to the computer. Each of the trait adjectives were presented for two seconds, regardless of the participant's latencies. The inter-trial interval was a minimum of 500 ms or until the participant responded to the adjective.

Incidental memory task. Following completion of the rating task, participants were told they had 3 min to type as many words as they could remember from the previously presented list of words. They were given 3 min to type their responses on the computer keyboard, which were recorded by the computer.

Mood re-induction and mood assessment

Mood re-induction. After completing the incidental memory task, mood was re-induced by having participants complete their respective MIP, which consisted of 20 of the 40 statements.

Mood manipulation check. Following the MIP, participants again completed the MVASs. These ratings were used to assess the stability of the mood manipulation.

Intentional recall. Participants next completed an intentional memory task involving 21 negative and 21 positive nouns.

Mood reinduction. After participants completed the intentional memory task, mood was re-induced by having participants complete their respective MIP, which consisted of the remaining 20 statements.

Mood manipulation check. Following the MIP, participants again completed the MVASs. These ratings were used to assess the stability of the mood manipulation.

Questionnaires. Finally, participants were asked to complete a battery of questionnaires, including the measures of cognitive style and personality discussed under Measures.

Results

Preliminary analyses

Gender

Gender differences on self-report and memory measures were analyzed across the entire sample using *t*-tests. Results revealed that females recalled significantly more positive, $t(144) = 2.25$, $p < .05$, and negative words, $t(144) = 2.34$, $p < .05$, in the incidental recall task, as well as more positive, $t(144) = 3.19$, $p < .005$, and negative words, $t(144) = 3.83$, $p < .001$, in the intentional recall task compared to males. No other gender differences were statistically significant.

Mood manipulation check

Mood ratings were separated into positive affect (PA) and negative affect (NA) scores. Briefly, Principle Components Analyses with Varimax Rotation revealed two dimensions that accounted for a significant portion of the variance of the six MVAS mood items at each of the four assessment periods. The first factor consisted of the "sad," "frustrated," and "anxious" items, termed NA; the second factor consisted of the "happy," "hopeful," and "cheerful" items, termed PA. NA and PA scales were computed by summing the three items comprising each of the respective scales. Correlations between PA and NA ranged from −.37 to −.44 across the four assessment periods.

In order to verify the success of the mood manipulation in altering NA, we conducted a 3 (Group) × 4 (Time) Repeated Measures ANOVA. Means and standard deviations are presented in Table 1. NA varied as a function of Group, $F(2, 142) = 30.85$, $p < .001$, Time, $F(3, 426) = 15.44$, $p < .001$, and a Group × Time interaction, $F(6, 426) = 9.97$, $p < .001$. Follow-up analyses indicated that NAT participants reported greater NA compared to ND at all time periods (all p's $< .001$), thus confirming that participants were appropriately assigned to groups at the start of the study. After the initial mood induction and each of the two mood reinductions, the EXP participants reported significantly greater NA compared to ND participants (all p's $< .01$), establishing the effectiveness of the MIP. Nonetheless, the EXP group reported less NA than the NAT group after the initial mood induction ($p < .001$) and the first reinduction ($p < .05$), but did not differ at the final reinduction.

Table 1
Effects of mood manipulation on negative affect

Group	Baseline		Post induction		Reinduction 1		Reinduction 2	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
ND	57.7	50.6	78.2	51.6	78.3	62.0	95.2	64.0
EXP	69.5	68.0	124.0	89.1	140.6	97.7	152.4	98.4
NAT	197.1	94.0	189.0	93.4	176.9	91.5	187.5	89.9

Note: ND = nondysphoric group, EXP = experimentally induced dysphoric group, NAT = naturally dysphoric group.

Table 2
Effects of mood manipulation on positive affect

Group	Baseline		Post induction		Reinduction 1		Reinduction 2	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
ND	245.5	77.7	225.0	87.3	220.5	93.4	223.6	93.5
EXP	278.7	80.0	205.1	109.5	189.9	117.9	174.7	114.8
NAT	133.0	70.3	118.2	73.1	120.8	69.7	122.6	76.2

Note: ND = nondysphoric group, EXP = experimentally induced dysphoric group, NAT = naturally dysphoric group.

Another Repeated Measures ANOVA indicated that PA varied as a function of Group, $F(2,142) = 23.36$, $p<.001$, Time, $F(3,426) = 31.53$, $p<.001$, and by a Group $\times$ Time interaction, $F(6,426) = 11.11$, $p<.001$. NAT participants reported significantly lower PA scores compared to ND at all time periods (all p's$<.001$), once again confirming that participants were appropriately assigned to groups. However, the MIP was not particularly effective at manipulating PA. PA was only significantly lower among EXP relative to ND participants at the final MIP ($p<.05$). Likewise, the NAT group reported lower PA than the EXP group at all time periods (all p's$<.05$). However, it was difficult to demonstrate effects because EXP participants had significantly higher levels of PA relative to ND participants at the baseline ($p<.05$), prior to the mood manipulation. Means and standard deviations are presented in Table 2.

Group differences in incidental and intentional memory

In order to test the impact of depression on memory for valenced stimuli, we conducted a 3 (Group) $\times$ 2 (Gender) $\times$ 2 (Valence) $\times$ 2 (Memory Task) Repeated Measures ANOVA with the latter two factors treated as repeated measures. Because Gender did not moderate any effects it was dropped from the model. Results indicated significant main effects of Valence, $F(1,143) = 12.52$, $p<.005$, and Task, $F(1,143) = 6.05$, $p<.05$, as well as significant Group $\times$ Valence, $F(2,143) = 10.19$, $p<.001$, and Valence $\times$ Memory Task, $F(2,143) = 37.14$, $p<.001$, interactions. However, these effects were embedded in a significant Group $\times$ Valence $\times$ Memory Task interaction, $F(2,143) = 6.91$, $p<.005$. See Table 3 for group means and standard deviations. The nature of this interaction was investigated by testing Group $\times$ Valence two-way interactions separately for the incidental memory task and intentional memory task. In the case of the intentional memory task, the Group $\times$ Valence interaction was not statistically significant, $F(2,143) = 0.51$. In contrast, in the case of the incidental memory task, the Group $\times$ Valence interaction was statistically significant, $F(2,143) = 18.01$, $p<.001$.

The Group $\times$ Valence interaction for incidental memory was further decomposed by conducting separate ANOVAs on positively and negatively valenced stimuli. For positive stimuli, there was a significant effect of group, $F(2,143) = 4.85$, $p<.01$. ND participants had a significantly higher frequency of recall of positive words than EXP ($p<.05$) and NAT ($p<.005$) participants. NAT and EXP participants did not significantly differ from each other ($p = .38$). Likewise, for negative stimuli, there was a significant effect of group,

Table 3
Group differences in memory

Memory type	ND		EXP		NAT		F value
	M	SD	M	SD	M	SD	
Intentional negative	5.74	1.74	6.13	2.32	6.08	2.46	0.46
Intentional positive	4.4	1.88	4.94	2.38	4.38	1.94	1.13
Intentional bias	−1.34	2.46	−1.19	2.64	−1.71	2.73	0.51
Incidental negative	4.76	1.89	5.37	2.37	6.44	1.62	8.89***
Incidental positive	6.58	1.95	5.61	1.99	5.31	2.32	4.85**
Incidental bias	1.82	2.21	0.24	2.81	−1.13	2.27	18.01***

Note: ND = nondysphoric group, EXP = experimentally induced dysphoric group, NAT = naturally dysphoric group. $^{**}p<.01$; $^{***}p<.001$.

$F(2,143) = 8.89$, $p<.001$. NAT participants had a significantly higher frequency of recall of negative words than EXP ($p<.01$) and ND ($p<.001$) participants. EXP and ND participants did not significantly differ from each other ($p = .14$).

Group differences in incidental memory bias

Memory bias scores were computed by subtracting the number of negative words recalled from the number of positive words recalled for each memory task. Higher positive values reflect a more positive bias, scores of zero reflect an absence of bias, and higher negative values reflect a more negative bias. A 3 (Group) × 2 (Memory Task) repeated measure ANOVA yielded significant main effects of Group, $F(2,143) = 9.80$, $p<.001$, and Memory Task, $F(1,143) = 38.04$, $p<.001$, as well as a significant Group × Memory Task interaction, $F(2,143) = 6.49$, $p<.005$. This interaction was decomposed by analyzing the effect of Group separately for each type of memory task. Consistent with previous results, analysis of the intentional memory bias yielded a nonsignificant effect of Group, $F(2,143) = 0.51$, $p = .60$, while the analysis of incidental memory bias yielded a significant effect for Group, $F(2,143) = 18.01$, $p<.001$. Follow-up analyses indicated that the NAT participants ($M = -1.13$) had a significantly greater negative bias scores compared to the EXP ($M = 0.24$), $p<.005$, and ND ($M = 1.82$), $p<.001$, participants, who also differed significantly from each other, $p<.005$.

To examine the presence and direction of incidental memory bias, t-tests were conducted separately for each group, comparing the bias score to zero (i.e., no bias, or evenhandedness). Bias scores found to be significantly greater than zero identified the presence of a positive bias, scores found to be significantly less than zero identified the presence of a negative bias, and scores that did not differ significantly from zero identified no bias, in other words evenhanded processing (see Gilboa et al., 1997). Results indicated that NAT, $t(47) = 3.43$, $p<.005$, participants had a statistically significant negative incidental memory bias, the EXP, $t(47) = 0.83$, $p = .41$, participants demonstrated no bias, or evenhanded processing, and the ND, $t(49) = 5.82$, $p<.001$, participants demonstrated a statistically significant positive incidental memory bias.

Cognitive style, state affect and incidental memory

We next wanted to examine the degree to which measures of cognitive style and state affect were associated with incidental memory for positive and negative stimuli in the sample as a whole. We focused only on incidental memory because the previous analyses suggested that depression-related factors contributed to incidental, but not intentional, memory. In order to insure that the mood induction did not influence measures of cognitive style, t-tests were conducted comparing the ND and EXP groups on the RSE, DAS and ASQ. None of these analyses were statistically significant (p's = .49, .78 and .15, respectively). Correlation analyses were then conducted to explore the degree to which self-report measures of cognitive style and state affect

Table 4
Correlations between measures of cognitive style and state affect with incidental memory for negative and positive words

Measure of cognitive style	Negative words	Positive words
DAS	.34***	−.09
ASQ	.33***	.06
RSE	−.39***	.13
PA	−.22**	.25**
NA	.14	−.29***

Note: DAS = Dysfunctional Attitude Scale, ASQ = Attributional Style Questionnaire, RSE = Rosenberg Self-Esteem Inventory, PA = positive affect, NA = negative affect. **$p < .01$; ***$p < .001$.

(measured immediately prior to the incidental recall task) were associated with incidental memory for positive and negative words.

As can be seen in Table 4, incidental memory for negative words was correlated with a more negative attributional style ($r = .33$), greater dysfunctional beliefs ($r = .34$), and lower self-esteem ($r = -.39$), and lower PA ($r = -.22$), whereas NA was not significantly correlated with incidental memory for negative words. On the other hand, incidental memory for positive words was correlated with higher PA ($r = .25$) and lower NA ($r = -.29$), whereas none of the correlations with measures of cognitive style were statistically significant.

Discussion

The present findings suggest that the effects of dysphoria on memory vary as a function of the nature of dysphoria (experimentally induced dysphoria versus elevated levels of depressive symptoms), the valence of the stimuli (positive versus negative self-evaluative words), and the nature of the memory task (incidental versus intentional). Although our results suggest that dysphoria has little effect on intentional memory, it appears to be more strongly associated with incidental memory. In particular, dysphoria was associated with impaired incidental memory for positive stimuli (in both individuals with induced dysphoria and those with elevated depressive symptoms) and with enhanced incidental memory for negative stimuli (in the case of individuals with elevated symptoms, but not those with induced dysphoria). Relative to nondysphoric individuals persons with either elevated levels of depressive symptoms or with experimentally induced dysphoric mood states tended to experience deficits in incidental memory for positively valenced stimuli. These findings suggest that dysphoric mood states of even a brief and transient nature can contribute to difficulties in the processing of positive information. On the other hand, enhanced incidental memory for negative information was only present among individuals with elevated levels of depressive symptoms. Those with experimentally induced dysphoric mood states did not significantly differ from nondepressed individuals in terms of memory for negatively valenced stimuli.

Bower's (1981) associative network theory would predict that experimental mood inductions that create dysphoric affect would result in memory biases, whereas schema theories (e.g., Beck, Rush, Shaw, & Emery, 1979) would predict that these temporary inductions of dysphoric affect would have little effect in the absence of stable underlying cognitive vulnerability. Our findings suggest that the processing of negative information is more strongly influenced by more stable aspects of dysphoria and is relatively uninfluenced by transient negative affect. First, the mood manipulation, which produced a transient dysphoric state, had no effect on memory for negative words. Likewise, when state affect was examined dimensionally in correlation analyses, state NA was not significantly associated with incidental memory for negative words, while PA had a significant albeit small correlation. On the other hand, naturally dysphoric individuals (who would have relatively depressotypic cognitive styles) tended to recall more negative words compared to both nondysphoric and experimentally induced dysphoric participants. Furthermore, in correlation analyses, low self-esteem, dysfunctional attitudes and a more negative attributional style were associated with greater incidental recall of negative words.

In contrast, the processing of positive information appears to be influenced by transient dysphoric moods, but not by cognitive style. First, the experimentally induced dysphoric individuals tended to recall fewer positive words on the incidental memory task compared to nondysphoric individuals. In fact, their performance was not statistically distinguishable from that of the naturally dysphoric individuals. This finding suggests that a transient dysphoric mood state can impair incidental memory for positive information. Further supporting this conclusion, correlation analyses that examined state affect as a dimensional variable found that both state negative and positive affect were associated with incidental recall for positive words. Individuals with more negative and less positive affect tended to recall fewer positive words. In contrast, the measures of cognitive style were not statistically significant predictors of memory for positive words. Given that our study relied on a negative mood induction and primarily negative measures of cognitive style, it is unclear how euthymic moods and positive cognitive styles might influence incidental memory.

Taken together our findings suggest that somewhat distinct factors contribute to enhanced incidental memory for negative stimuli and impaired incidental memory for positive stimuli. Our results suggest that stable individual differences in cognitive style play a more important role in recall of negative memories, whereas affective states appear to play a more important role in recall of positive memories. Together, these results suggest that the network model might provide a better account for mood-congruent memory for positive than negative stimuli, whereas the schema model might provide a better account for mood-congruent memory for negative than positive stimuli.

In the present study, data were also examined in terms of incidental memory *biases* by determining the degree to which individuals recalled greater or lesser numbers of negative than positive stimuli. Bias scores significantly greater than zero were indicative of a positive bias, those significantly less than zero represented a negative bias, and scores that did not differ significantly from zero were interpreted as no bias or evenhandedness. Results suggested that while nondepressed individuals have positive memory biases (i.e., they recall greater proportions of positive stimuli than negative stimuli), individuals with elevated levels of depressive symptoms tend to exhibit negative biases (i.e., they tend to recall greater proportions of negative stimuli than positive stimuli). In contrast, individuals with experimentally induced dysphoric moods recalled equivalent numbers of positive and negative words, thus demonstrating no bias or evenhandedness. The previously discussed findings suggest that the loss of positive biases that may come with dysphoric mood states primarily results from the impairments to memory for positive information rather than to enhanced memory for negative information.

Our results suggest that elevated levels of depressive symptoms and experimentally induced dysphoric mood have circumscribed effects on memory. In particular, these effects were isolated to the incidental recall of valenced stimuli that were rated in terms of self-reference. No significant effects were found in terms of intentional memory for valenced words. It is possible that when individuals are explicitly instructed to memorize valenced words different mnemonic processes are used than when incidental memories are formed, and furthermore these processes are relatively uninfluenced by depression. Unfortunately, the present design is unable to rule out the possibility that results differed between the two memory tasks because the two tasks used different sets of stimuli. To address this issue, future research would need to use the same stimuli in both the incidental and intentional memory tasks. Future research might also examine the potentially distinct effects of incidental memory tasks with and without self-evaluative encoding procedures. The present study also was not able to determine if depression affected incidental memory by influencing encoding versus retrieval processes. It remains for future research to determine the stage of processing in which depression impacts memory.

We should also acknowledge several additional methodological issues and limitations. First, we administered our incidental memory task, intentional memory task and questionnaires in a single fixed order, and consequently there may have been carry over effects. In other words, completion of earlier tasks may have influenced performance on subsequent tasks. This issue would be of particular concern if such carry over effects differentially impacted the three groups, perhaps by affecting the dysphoric groups most strongly. For example, it is possible that among the more dysphoric participants, reading and making ratings on the negative words lead to a negatively biased reporting style on the questionnaire measures of cognitive style completed at the end of the protocol. On the other hand, we elected to administer these questionnaires at the end of the protocol in order to avoid the parallel concern that the questionnaires could influence our measurement of memory for valenced stimuli. Furthermore, we tested for this potential bias and found that the EXP and ND groups did not differ on any of the questionnaire measures. A second issue concerns the possibility that participants assigned to the negative mood induction, in which they repeatedly read negative statements, might have guessed that we expected them to recall negative words in the memory tasks. Consequently, these individuals may have developed a response bias favoring negative word content. Future studies with more subtle mood manipulations could address this issue.

Although our findings suggest that naturally occurring depressive symptoms and experimentally induced dysphoric affect have somewhat different effects on memory, it is possible that the nature of the affective state created by the induction is critical. In the present study, the mood induction was only successful in increasing negative affect, and had virtually no effect on positive affect. The consequences of a mood induction that both increased negative affect *and* decreased positive affect remain to be seen. It is possible that such a mood state would result in negative memory biases rather than the evenhanded memory demonstrated in the present research. Likewise, a more powerful mood induction that resulted in levels of negative affect comparable to those exhibited by the naturally dysphoric individuals might have resulted in negative biases rather than evenhanded memory. It is also possible that depression-prone individuals, such as individuals with a past history of depression, are more sensitive to the effects of mood inductions (see Persons & Miranda, 1992). Unfortunately, previous depression was not assessed in the present study. Likewise, elevated depressive symptoms were assessed by self-report. Although the mean BDI score of the elevated symptom group (20.5) is considered to be within the clinical range, future studies would need to determine whether or not our findings generalize to clinically depressed individuals who meet criteria for Major Depressive Disorder. Finally, it would be of considerable importance to examine whether such incidental memory biases are associated with the course of depressive conditions, including remission and relapse.

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