

Toward Better Specification of the Mood-Congruency Effect in Recall

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According to the mood-congruency hypothesis, happy material is learned better in happy moods, and sad material is learned better in sad moods. One explanation of the effect is provided through the associative network model of mood; moods activate concepts with similar valence, which in turn activate still other, similarly valenced material. The greater density of associations that are available when a mood is activated renders mood-congruent material easier to learn and remember. Certain controversies exist concerning the effect; for example (a) it may be easily alterable—or even caused—by instructions, (b) it may be related to mood strength, and (c) it may be moderated by personality variables. One hundred and ninety-six participants went through mood-congruency procedures. Mood congruency appeared, was unrelated to various instructional manipulations, unrelated to reported mood strength, and mostly unrelated to personality variables. Such a pattern suggested a spreading-activation explanation, perhaps due more to cognitive priming than mood per se. © 1990 Academic Press, Inc.

Mood congruency exists when individuals find it easier to learn and recall material that matches their mood in emotional content. That is, a

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happy person better learns and recalls more pleasant material, a sad person, more unpleasant material. Because this mood-congruency effect is the most stable of all mood and memory phenomena (Blaney, 1986; Isen, 1984; Mayer, 1986; Mayer & Bower, 1985; Mayer & Salovey, 1988; Salovey & Singer, 1989),¹ it may be (relatively) the easiest of the mood and memory effects to understand. If so, such an understanding could in turn be used to better understand more controversial mood and memory effects, such as mood-state dependent memory (cf. Bower & Mayer, 1985; 1989). The present experiment examines mood congruency and the experimental conditions that may influence it.

The most widely accepted explanation of mood congruency is that it occurs in the context of the associative network model proposed by Bower (Blaney, 1986; Bower, 1981; Mayer, 1986; Singer & Salovey, 1988). Moods serve as central units or *nodes* in an associative network which are activated when a mood is experienced. Once activated, the mood nodes activate mood-associated concepts, thereby making associated material more readily available for memory encoding and/or retrieval. The activation of such mood nodes leads to mood congruency because the heightened memory for mood-related concepts (such as a lover's kiss in a good mood) makes it easier to form associations to new mood-congruent material.

Specification of Effects

The associative memory description of mood congruency predicts (a) the effect should be relatively independent of instructions, and (b) the effect should be influenced by mood strength. But the mood-congruency effect may manifest other characteristics as well.

Voluntary control. Mood congruency may be sensitive to specific experimental instructions. For example, instructing subjects to enter into a mood might create demands among subjects who surmise the hypothesis of the study. Or, the request that participants maintain, say, a happy mood, might lead participants to concentrate on recalling pleasant words in the belief that such selective attention will help them maintain their happy moods. If correct, then alternative instructions should modify the effect.

Asymmetrical qualities. Next, mood congruency may be more apparent in some moods than others. For example, one claim is that happy moods produce a larger effect than sad moods (Isen, 1984; Isen, Shalcker, Clark, & Karp, 1978). Isen et al. suggest that any reliable asymmetries are due to mood-regulatory processes. That is, positive thoughts serve the purpose of maintaining good moods. In contrast, people in sad moods mix

¹ This excludes mood-congruent judgment, which is an even more stable finding but may not be best considered a memory effect (Mayer & Salovey, 1988).

happy thoughts with sad ones in an attempt to repair their sad moods. Alternative explanations of asymmetrical effects are also possible (cf. Blaney, 1986).

Mood strength influences. Another question is whether mood strength covaries with the effect. Blaney (1986) noted that mood congruency appears independent of mood intensity. He suggested that the images or memories typically used to induce mood could prime learning and recall for mood-congruent stimuli, independent of any mood influence. The few studies that have reported median splits on mood have relied on small N 's, however, and so it remains unknown whether stronger moods lead to an enhancement of the effect. Should mood strength and mood congruency covary it would support the role of mood; should they not, it would support priming conceptions, that is, that the effect relies on associations to mood induction stimuli rather than on moods per se.

Mood state by trait interactions. Related to mood-strength influences is the idea that mood strength may interact with the person's typical (trait) mood. Participants can be asked to take a scale such as the Beck Depression Inventory, which reflects moderate-term mood (e.g., over a week or so), and when the present mood agrees with the more typical mood, the mood's influence may be stronger. This is because longer-term mood dispositions may reflect the prior buildup in long-term memory of a disproportionate number of concepts related to a particular mood (e.g., happy or sad). Such a multitude of mood-related concepts might in turn facilitate the cuing of the to-be-learned stimuli to that mood when it is activated, more so than to the opposite mood (Mayer & Salovey, 1988).

Introduction to the Present Experiment

The present experiment is an investigation into mood congruency that examines the above effects. The experiment asks: Is mood congruency determined in part by particular instructions? Is it symmetrical in happy and sad moods? Is it related to mood strength? And, is it moderated by more long-term mood qualities?

The mood inductions employed here utilized music-enhanced guided imagery. To enter a happy mood, participants read happy stories while listening to happy music; to enter a sad mood, they read sad stories while listening to sad music (e.g., Clark, 1983). A number of participants in the study received special instructions designed to examine voluntary control over the effect.²

² These instructional manipulations originally formed three individual experiments. Because the design was essentially identical across experiments, they were combined into a larger, single experiment for brevity of exposition. The original conditions of the experiments are treated within the methods section as conditions within this larger experiment.

METHOD

Subjects

Subjects were 196 students from the State University of New York at Purchase who were fulfilling a requirement for an introductory psychology course, or were volunteers recruited from introductory Biology or Freshman Studies courses.

Subject safety. To protect subjects during the mood-induction procedures, a modified³ short form of the Beck Depression Inventory (Beck & Beck, 1972; 13 items scored 1–3) was used with a cutpoint of 22, which would correspond to about a 15 on the full scale. This cutpoint screened out the 10% most depressed subjects. The remaining subjects were asked to keep their moods at moderate levels. In addition, the half sample who received a final sad mood were given an extra happy mood induction before leaving.

Overall Design

A 5 (instruction groups) \times 2 (high or low incoming score on the Beck Depression Inventory) \times 2 (happy or sad induced mood) \times 2 (happy or sad word content) mixed design was used, where instructions and incoming Beck scores were between-subjects factors and mood (happy, sad) and word content (happy, sad) were within-subjects factors. A given participant, for example, would be assigned to one of five instruction groups, be classified as a high or low depression group member based on the participant's incoming Beck Depression Inventory, be entered into a happy (or sad) mood, learn a list composed of both happy and sad words, and recall them. The person would then be entered into the opposite mood and the same instructions and procedure would be repeated. Mood order, word lists, music selections, and mood-induction vignettes were all counterbalanced across subjects. Neutral moods and words were not used because of the difficulty in locating a true neutral point. Because the Beck Depression factor could not be manipulated, it was not counterbalanced across conditions. The conditions are described next.

The standard condition (1). The *standard condition (1)* was designed to resemble that found in typical mood-congruency studies. Participants were told to "get into the [designated] mood, and that it was important to maintain it" until the recall period was over. These and all later

The three identical control groups from the three original experiments were formed into the present standard condition. Conditions 2–4 came from two experiments examining the effects of instructions on the effect. Condition 5 came from an experiment attempting to enhance the effect.

³ This was modified for nonclinical settings by Dan Weinberger of Stanford University.

instructions were presented both in written and verbal form to make sure the subjects understood and followed them as best they could. The last line of the instructions directed subjects to check a box at the bottom of the page to indicate they had read and understood them. Any subject who failed to do so was asked to reread the instructions carefully.

Contrast conditions (2-4). The purpose of contrast conditions (2-4) was to examine whether instructional manipulations during the mood inductions might reveal demand or related effects. Our hypothesis was that mood congruency would be weakest in the group with the least instructional emphasis on moods, and relatively strongest in standard condition, described above, in which the group is instructed to enter into and maintain a mood.

For instance, it is often argued that subjects who are asked to "get into" a mood (which is necessary to attain it, e.g., Clark, 1983), might additionally try to help the experimenter by deducing the hypothesis and showing the mood-congruency effect as well. For that reason, instructions alerting the participant to the importance of mood were toned down in condition 2. In this *no-change* condition (2), subjects were only told that "the music may or may not cause your mood to change," and that there would be a mood scale to complete at regular intervals.

As indicated earlier, it may also be that instructions to "be sure to maintain your mood" invite subjects to overstudy mood-congruent material in the belief that such differential attention would help them maintain their mood; so, participants in the *mood-change* condition (3) were told to "get into the [designated] mood", but that after learning the word list, they should "allow their mood to change or stay the same depending on their natural inclinations."

Another manipulation to discourage participants from consciously attending to the mood-congruent words was employed in the *maintenance* condition (4). Subjects were told to maintain the intensity of their induced moods *by recalling mood-induction vignettes*. This experimenter-supplied strategy was provided to give subjects a competing response to any attempts to try to maintain their moods by attending differentially to mood-congruent words during learning or recall.⁴

⁴ Of subsidiary interest was a within-subjects manipulation of mood-induction speed. Because mood strength might be involved in obtaining mood congruency (Mayer & Bower, 1985), it was worth learning whether slowing down the mood induction might strengthen mood effects. In the fast condition, subjects read vignettes at the rate of 30 s per vignette; in the slow condition, at the rate of 60 s. These were counterbalanced across other factors such as experimental condition, mood order, and mood-induction vignettes. By the most sensitive statistical test (*t* test) this had no effect on resulting mood ($t(64) = 1.32$, n.s.). Because it also had no effect on mood congruency, and because it pertains to only 40 of 196 subjects, it will not be further discussed.

Contrast condition 5. Condition 5 tested whether associating the to-be-learned stimuli more closely to a subject's mood would enhance mood congruency over prior studies. To enhance the association, subjects in the fifth condition generated the happy and sad content words used in the experiment themselves in response to highly restricted cues described below. Because subjects generate the material themselves, it may be more strongly associated to internal mood states (Eich & Metcalfe, 1989; Slamecka & Graf, 1978). In the *generate* condition (5), the same 20 words were learned as in the other conditions, but it was the subjects' task to generate the words from a set of highly specified, multiple cues. For a given word such as *kiss*, a definition was first presented (e.g., "To touch or caress with the lips"), followed by the sentence that used the word, and included its first two or three letters (e.g., "He gave his girlfriend a ki_").⁵ The generation cues were then ordered so as to correspond to the lists in other conditions (see below). Subjects were instructed to fill in the blank spaces as quickly as possible, and to skip any they could not complete within 30 s. The generate condition's learning advantage would be partially offset by subjects in other conditions seeing the word list twice.

Equipment

A Sony Walkman tape cassette player with two sets of headphones was used to play music-induction tapes.

Materials

Mood scale. A 21-point mood scale was used to measure mood, which was anchored at the "-10" end by *sad*, and at the "10" end by *happy*.

Word lists. Twenty pleasant and 20 unpleasant words were closely equated on the basis of imagery ($M = 5.37$ versus 5.05), concreteness ($M = 4.27$ versus 4.19), and meaningfulness ($M = 6.54$ versus 5.98) according to published word norms (Paivio, Yuille, & Madigan, 1968), and also on word frequency ($M = 37.8$ versus 41.3; Kucera & Francis, 1967). The 40 words were divided equally into two matched 20-word lists so that each list contained 10 pleasant and 10 unpleasant words. Each participant saw one word list presented in two counterbalanced orders in the initial induced mood, followed by the other word list also presented in two counterbalanced orders in the opposing mood condition.

Mood inductions. The mood inductions used guided imagery enhanced by music. For the imagery portion of the induction, participants read through a series of vignettes. The complete vignette set consisted of 16

⁵ Even highly determining cues show what has come to be called the generation effect (Slamecka & Graf, 1978) so long as the words are meaningful (McElroy & Slamecka, 1982).

happy and 16 sad 1- to 3-sentence stories. These vignettes were used only to induce moods and were not tested for mood-congruent recall. An example of a happy vignette was "You spend a day up in the mountains; the air is clean and sharp, the day is sunny, and you take a swim in a beautiful lake." A sad vignette was, "You pass a demonstration commemorating the victims of Hiroshima. You think of atomic bombs destroying your hometown." The vignettes were divided into four forms: two sets of eight happy instances and two sets of eight sad instances. These forms were counterbalanced across inductions.

The happy music used to enhance the happy imagery inductions included "Coppelia" by Delibes, "The Good Life" by Tim Weisberg, and the "Brandenberg Concerto No. 2" by Bach. The sad selections were "Russia Under the Mongolian Yoke" from *Alexander Nevsky* by Prokofiev, and "Emmanuel" by Michel Colombier. The extra happy selection was used at the end of the study to provide a final happy mood for those subjects who ended the experiment with a sad mood. For the final 72 participants Mozart's "Toy Symphony" was substituted for Tim Weisberg's "The Good Life," in an attempt to improve the happiness levels of the happy music used.

Postexperimental questionnaire(s). A postexperimental questionnaire was administered to the final 136 participants. The questionnaire asked how the subject maintained his or her mood, and what the subject thought the experimental hypothesis was.

Procedure

Subjects were tested alone or in pairs. Upon arrival, the Beck Depression Inventory short form was administered. Participants were then given verbal and written instructions specific to their experimental condition (see above). The mood-induction procedure began with the participant donning headphones, and listening to mood music for 1 min. At the end of a minute, the subject was signalled (by blinking light) to begin reading the first mood-induction vignette, and subsequently signalled at 45-s intervals to read through the remaining seven vignettes (see footnote 4). After the eighth and final vignette, subjects rated their moods.

Once they did so, the learning period commenced. Still listening to the music, and using the same prearranged signal involving the light, the subject read through the 20-word list twice in two different orders at 3 s per word (except in condition 5, see above).

The subjects were then given 90 s to write down as many words as they could remember (recall that mood-induction vignettes were used for mood-induction purposes only and were not tested for recall), at the end of which time the music was stopped and a final mood rating was obtained.

After completing this portion of the experiment, the second, opposing

TABLE 1
AVERAGE MOOD LEVELS ACROSS THE VARIOUS CONDITIONS OF THE EXPERIMENT

Condition	N	Beck	Baseline mood	Postinduction mood level	
				Happy	Sad
(1) Standard	88	16.7	2.8	4.7	-2.4
(2) No Change	20	17.1	1.8	2.0	-1.4
(3) Change, No Maintenance	20	15.5	3.5	5.2	-2.0
(4) Competing Strategy	32	16.3	3.5	5.3	-3.2
(5) Generate	36	15.8	3.2	4.0	-1.3
Overall	196	16.4	3.1	4.4	-2.3

mood induction was employed, followed by learning of the alternate list, a similar recall period, and mood ratings. If the final mood was happy, subjects were then dismissed; if sad, then they went through a final happy mood induction so as to repair their moods, and were then dismissed from the experiment with thanks.

RESULTS

Overall Mood Levels

The average participant entered the study in an already happy mood ($M = 3.1$ on the mood scale which ranged from -10 (sad) to 10 (happy)). The happy mood manipulations led to overall happy moods of $M = 4.4$ across conditions. Thus the sample, which was generally happy initially, improved their moods modestly ($M = 1.3$ points, $t(195) = 6.5$, $p < .0001$) on the scale from their initial level. The sad moods were at $M = -2.3$ across conditions, for a conditional change of $M = -5.4$ from their starting level ($t(195) = 18.7$, $p < .0001$).

The mood levels can be seen in Table 1, broken down by condition. In a Mood (happy/sad) \times Instruction Condition (standard/no change/change with maintenance/competing strategy/generate) \times Beck group (depressed/nondepressed) ANOVA for uncorrected mood, a main effect for mood ($F(1, 186) = 35.5$, $p < .001$) indicated happy moods were rated overall stronger than sad ones (although conditionalized change leads to a reverse conclusion). In addition, a main effect for condition ($F(4, 186) = 4.38$, $p < .002$) indicated that there were differences across instruction groups. Orthogonal contrasts indicated that the no change instructions led to significantly weaker mood levels ($F(1, 186) = 11.1$, $p < .001$) than the standard condition, and that the competing strategy instructions showed a trend toward producing stronger mood levels ($F(1, 186) = 4.49$, $p < .04$; $\alpha = .0125$ by the Bonferonni correction for these contrasts) relative to the standard condition. No other main

TABLE 2
MEAN WORD RECALL AMONG THE VARIOUS CONDITIONS OF THE EXPERIMENT

Condition	Mood	N	Recall			
			Word type		Congruence (same-diff.)	Total
			Pleasant	Unpleasant		
(1) Standard	Happy	88	4.97	4.48	.49	9.45
	Sad	88	4.84	4.98	.14	9.82
(2) No Change	Happy	20	5.15	4.35	.80	9.50
	Sad	20	5.10	5.00	-.10	10.10
(3) Change, No Maintenance	Happy	20	5.05	4.55	.50	9.60
	Sad	20	5.15	5.35	.20	10.50
(4) Competing Strategy	Happy	32	5.19	4.31	.88	9.50
	Sad	32	4.69	4.66	-.03	9.35
(5) Generate	Happy	36	3.89	3.64	.25	7.53
	Sad	36	3.25	3.14	-.11	6.39
Overall	Happy	196	4.83	4.29	.54	9.12
	Sad	196	4.58	4.63	.05	9.21
	Total	196	9.41	8.92	.59	18.33

effects or interactions reached statistical significance. Thus, the mood inductions were successful overall, and also reflected the effectiveness of the instructional manipulations.

Mood congruency, differential learning, and asymmetrical effects. The learning of pleasant and unpleasant words, and the amount of congruence (e.g., correspondent-valenced words minus opposing-valenced words) can be seen in Table 2, broken down by condition. A four-way Mood (happy/sad) \times Word-Congruency (same/different than mood) \times Condition (1-5) \times Beck scale ANOVA tested the main hypotheses of the experiments. Participants' overall learning varied across conditions ($F(4, 186) = 12.1, p < .001$). Orthogonal contrasts indicated poorer learning in the generate condition, in which subjects saw the word list once rather than twice ($F(1, 186) = 39.9, p < .001$), as well as a trend toward better learning in the no maintenance condition ($F(1, 186) = 4.8, p < .03$; Bonferroni adjusted $\alpha = .0125$). Across the 196 subjects, there was no difference in learning in happy or sad moods ($F(1, 186) = 0.19, n.s.$). There was a mood by instruction condition interaction ($F(4, 186) = 3.8, p < .005$) that orthogonal contrasts indicated was due entirely to the generate condition, and which was therefore most likely due to the substantially different stimuli used in that condition. There were no other significant main effects or interactions for overall mood.

There was a significant overall effect for mood congruency ($F(1, 186) = 4.5, p < 0.05$), and no interaction at all by instruction condition ($F(4, 186) = .41, n.s.$). There was, however, a mood congruency by Beck

group interaction ($F(1, 186) = 4.1, p < .05$). Participants scoring at higher depression levels showed less mood congruency (M congruent = 9.5 versus M incongruent = 9.2) relative to the happier participants (M congruent = 9.4 versus M incongruent = 8.6). Orthogonal contrasts indicated the difference for the more depressed subjects was almost entirely accounted for by their behavior in the third condition, no maintenance, where they showed a trend toward mood incongruency relative to the standard condition (M congruent = 9.6; M incongruent = 11.1; $F(1, 186) = 5.6, p < .02$; Bonferroni adjusted $\alpha = .0125$).

Finally, there was a mood by congruency interaction ($F(1, 186) = 7.3, p < .01$) that indicated that pleasant words were recalled better than unpleasant words in happy moods, but that pleasant and unpleasant words were recalled equally well in sad moods. No conditions varied from the standard condition in this effect; nor were there any higher order interactions.

Mood congruent list intrusions. An analysis identical in form to the above, but examining only words *misrecalled* as being on the list (extralist intrusions) found significant mood congruence as well. Overall, a Wilcoxon matched pairs signed ranks test indicated that 46 subjects had congruent recall, 26 incongruent, and 124 ties ($z(72) = 2.7, p < .01$). For happy moods alone, the respective results were 27, 19, and 150, which was not significant ($z(46) = 1.4, n.s.$). For sad moods alone the respective results were 31, 15, and 150 which was significant ($z(46) = 2.5, p < .02$).

Mood strength and mood congruency. An additional issue is whether mood strength predicts the size of mood-congruency effects. To test this hypothesis, the subjects' ratings of their happy mood strengths were correlated with the number of pleasant words they recalled minus the number of unpleasant words while in that mood. Happy mood strength did not predict congruent recall ($r(196) = .03, n.s.$); nor was this prediction improved by subtracting out the subjects' baseline mood from their rated mood strength in an attempt to correct for any bias in scale usage ($r(196) = .00, n.s.$). Similarly, the strength of a sad mood did not predict the amount of mood-congruent material learned ($r(196) = .06, n.s.$; $r(196) = 0.05, n.s.$, corrected for baseline mood). Even examining only the extreme high and low quarters of happy moods ($r(93) = .02, n.s.$) and sad moods ($r(96) = .10, n.s.$) showed no influence.

Perhaps the nonexistent correlation between mood strength and mood congruency was due to different people using the mood scale in different ways. To check this possibility, a test for the mean difference in mood congruency within the individual's strongest mood (using z scores for mood strength) was checked against that for their weaker mood. Again there was no effect, whether mood strength was measured from the zero

point of the scale ($t(195) = .35$, n.s.) or corrected for the greater levels of happiness in the sample ($t(195) = 1.51$, n.s.).

A power analysis can be used to indicate the sensitivity of the correlational tests used above. The odds that a statistically significant relation would have been found between mood strength and congruency ($1 - \beta$) at the $\alpha = .05$ level or beyond, given a population correlation of $p = .20$, would be 81%; given a $p = .30$, it would be 99% (Cohen & Cohen, 1975, p. 55). It can therefore be stated with 81% confidence that reported mood accounts for less than 4% of the variance of mood congruency in this experimental context.

Other hypotheses. In postexperimental questionnaires, the 136 final subjects in the study were asked whether they knew the hypothesis of the experiment, and whether they had used strategic attention (e.g., purposely attended to those words that agreed with their mood so as to maintain their moods). Eighteen of 136 subjects were able to give clear statements of the mood-congruency hypothesis; 46 gave vague or imprecise statements that were not possible to classify, and 72 gave statements that were clearly different or opposed to the hypothesis. A modified ANOVA from the above, testing an Awareness-of-Hypothesis \times Mood Congruency interaction indicated the effect was not significant ($F(2, 133) = .81$, $p < .45$). In fact, the 18 subjects who did clearly state the experimental hypothesis showed *negative* mood congruency (Mean congruency = $-.28$ words). Similarly, the 12 of 136 subjects who claimed to have used strategic attention to improve their moods showed no different mood congruency ($F(2, 133) = 1.15$, $p < .32$), and also showed mood incongruency (Mean congruency = $-.67$ words). Thus, neither experimental knowledge nor reported strategic attention made any apparent contribution to mood congruency in this experiment.

To summarize the more important findings, mood congruency was obtained, and it was more pronounced in happy moods. The mood-congruency effect was apparently unaffected by instructional manipulations or by differences in mood strength.

DISCUSSION AND CONCLUSIONS

Mood Congruency

The central aim of these experiments was to better specify information about mood congruency in memory. People did learn more pleasant material and less unpleasant material in happy moods, and about the same amount of pleasant and unpleasant material in sad moods. An independent analysis indicated that mood congruency of misrecalled items (extra-list intrusions) was also found. The basic finding of mood congruency in recall was interestingly unperturbable in response to a

number of experimentally manipulated and naturally occurring influences. The mood congruency finding was present independent of mood strength, independent of alterations in mood instructions (conditions 2-4), and independent of whether subjects generated the to-be-learned stimuli themselves (condition 5).

Mood congruency occurred even though subjects reported almost no use of strategic attention, and almost no knowledge of the experimental hypotheses on a postexperimental questionnaire. Although it remains possible that one or more of these variables could enhance the effect, any claim that mood congruency is caused by wholesale, conscious, selective attention on the part of subjects seems ruled out. Mood congruency is not, however, a monolithic effect, and exceptions to the effect will be discussed below.

Better Understanding Mood Congruency

Mood congruency and demand. The above evidence consistently contradicts demand explanations. According to the demand explanation mood congruency should be less likely when any mention of mood inductions is omitted from the experimental procedure, but this had no apparent influence on congruency (tested in condition 2). It could be reasonably argued that condition 2 by itself involved an insufficiently large sample to detect a difference; other evidence that demand was not operating was, however, also present. Demand would predict that the effect should occur most strongly among those subjects who were aware of the experimental hypotheses (tested by postexperimental questionnaire). However, such *aware* subjects actually showed (nonsignificantly) less mood congruency than other subjects. One could counterargue that any such self-report of knowledge is unveridical in relation to actual participant knowledge (cf. Ericsson & Simon, 1980). But even stronger anti-demand evidence exists: It is very unlikely, for instance, that participants would perceive a demand to produce asymmetrical mood-congruency effects, yet such asymmetries were present at statistically significant levels. It is similarly unlikely that any participants complying with a perceived demand would not covary the strength of their mood report with the congruency effect they showed. And yet a very powerful test showed no relation between mood strength and congruency. Because no patterns implicating demand explanations were found, it is an implausible explanation of laboratory mood congruency.

Nature of the Congruency Effect

The asymmetrical pattern of congruency. More mood congruency was found in happy than sad moods. This might at first seem a result of the participants' reports of stronger induced happy moods than sad ones (which is consistent with typical findings concerning mood manipulations,

cf. Blaney, 1986). Because mood strength is unrelated to mood congruency (see below), however, mood strength is unlikely to account for the asymmetry. In addition, if corrections for mood baseline are taken into account such a mood-strength explanation falls apart entirely because the sad mood-induction procedure was much more effective than the happy one in altering initial moods.

Another explanation for the asymmetrical congruency is that sad people override congruency because such individuals regulate their moods by thinking good thoughts. Pleasant and unpleasant word lists were carefully equated in this study. Unfortunately, equating cannot be done with certainty. It is possible—though not necessarily likely—that another equally well equated word list would include more difficult-to-learn unpleasant words that would shift the interaction such that mood congruency would exist only in sad moods. Under such conditions, people in happy moods would remember happy and sad words equally, while those in sad moods would remember fewer sad words. Such a pattern, however, would still support the regulation idea because the issue is the relative learning rather than any absolute amount.

Germane to the regulation concept are both the survey finding that people regulate their moods more in sad moods (Mayer & Gaschke, 1988), and the experimental finding that sad-mood-induced subjects who are high self-controllers actually show mood incongruency, that is, they recall more happy stimuli (Parrott & Sabini, 1989). Such an effect may explain the unexpected finding of mood incongruency among the sadder (high Beck) sad subjects in the no maintenance condition. The no maintenance condition was the only one in which mood-induced subjects were essentially told they could let their induced moods get better or worse during learning, without violating the rules of the experiment. Given the opportunity, these sad individuals engaged in activities that led to a 1.5-word average superiority in recalling happy words, the only such pattern of incongruency in the experiment.

Mood strength and the cognitive priming hypothesis. The results further suggest there is little or no relationship between self-reported mood strength and mood congruency in recall. In the overall analysis of subjects from all experimental conditions, mood levels and the congruency effect were entirely unrelated; a subsequent power analysis confirmed that this occurred in the context of a highly sensitive statistical test.

Where does the link between mood strength and congruency break down? Mood reports are generally valid measures of mood (see Mayer & Salovey, 1988; and Nowlis, 1965, for reviews). In experimental contexts, in particular, such ratings have been shown to reflect theoretically expectable mood change across time and different induction techniques (Isen & Gorgoglione, 1983). The breakdown between mood strength and congruency also does not appear due to any postinduction restriction of

mood range. The standard deviation for happy moods in these experiments was 2.8; that for sad moods was 3.3, and that for subjects entering the experiment before any mood inductions was 3.5; a comparison of the smallest to largest standard deviations confirms that any range restriction in the present experiment would be unlikely to obscure even a quite small effect, such as $p = .20$ (McNemar, 1969, p. 163).

If mood strength is unrelated to mood congruency, then one possible explanation is because something other than mood causes the effect. The cognitive priming hypothesis (Blaney, 1986), for example, predicts that mood congruency will appear under all conditions in which subjects have been exposed to the directed memory mood inductions, independent of any actual induced mood. That is, of course, exactly what happened in these experiments⁶ (see also Perrig & Perrig, 1988). Such a priming hypothesis would also explain the lack of mood congruency findings using naturally occurring mood, which may have many partly or entirely noncognitive instigators (e.g., biochemical cycles, exercise, food, weather), which could bring about the mood with less priming.

But such priming explanations are not so different from spreading activation explanations. For one thing, mood-related cognitions are probably best thought of as constituting part of mood (Mayer & Bremer, 1985; Mayer, Mamborg, & Volanath, 1988; Mayer & Volanath, 1985). In this view, sad cognitions, for example, are a sad mood (as would be the concomitant physiological changes). In addition, there is some evidence that argues for spreading activation. Erlichman and Halpern (1988) recently examined memory retrieval in the presence of pleasant and unpleasant odors, primarily noncognitive stimuli that nonetheless yield clear mood-congruency effects. The above evidence suggests—although it is far from conclusive—that it is the cognitive aspect of mood, rather than the purely emotional or physiological qualities, that is most responsible for mood congruency.

Conclusions

As mood-congruent recall becomes better understood, it begins to take on a unique character, separate from those of many other cognition-and-affect phenomena. For example, mood-congruent recall effects apparently require mood inductions or psychopathology to appear. In contrast, other superficially similar effects such as mood-congruent judgment com-

⁶ The mood-congruency results found here were not, however, due to any direct word-to-word priming from the induction material to the to-be-recalled lists. Five words in the induction materials (friend, fun, healthy, pleasant, and trouble) also appeared in the word lists. The four pleasant words were actually (nonsignificantly) better recalled after sad mood inductions; similarly, the one unpleasant word was better recalled after happy inductions. Thus, any priming that took place was more likely the result of activation at a more abstract level.

monly appear in naturally occurring moods (Mayer, Mamberg, & Volanth, 1988). Furthermore, mood-congruent recall effects are (for whatever reason) asymmetrical, whereas mood-congruent judgment effects are not (Mayer, Mamberg, & Volanth, 1988). Mood-congruent recall may best be described in priming, or associative network terms. Whatever its ultimate explanation, as mood congruency is increasingly understood, its prediction and control in the laboratory, and perhaps even its theoretical contribution to alleviating painful moods, become more possible.

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