Mood-Congruent Memory and Natural Mood: New Evidence

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The mood-congruent memory effect states that happy people will better remember happy than sad materials, whereas sad people will better remember sad than happy materials (or remember such material equally). Clinical studies and those employing experimentally induced moods find evidence for mood-congruent memory, but results from both types of studies can be explained by nonmood influences. Mood-congruent memory has not yet been found in normal people in everyday moods. The authors find evidence for the effect among normal individuals in three studies (N = 614). This supports prior experimental and clinical findings—and means that mood and memory constantly covary in everyday experience.

Personality can be conceptualized as an organization of such diverse psychological systems as *mood*, *memory*, *judgment*, and *motivation*, among many others (e.g., Angyal, 1941; Barratt, 1985; Mayer, 1993-1994, in press; Pervin, 1990). Although these systems are partially distinct from one another, they interact in certain ways. Knowledge of their interactions can be employed to make sometimes surprising predictions from one personality system to another. For example, knowing a person's current mood permits certain predictions about that person's current cognitive evaluations and judgments (for a review, see Fiske & Taylor, 1991). Knowing a person's current mood, however, does not yet permit comparable predictions about a person's memory. The ability to predict from everyday mood to memory would be an important advance in personality psychology because, as the memory system changes, so will those personality processes that depend on it (e.g., the retrieval of past experiences). Part of understanding personality is knowing which memory characteristics are due to the influence of mood and which are due to other influences.

This article will present new evidence that everyday mood does bring about a hypothesized effect on memory, termed *mood-congruent memory*. Mood-congruent material is that which matches a current mood in its pleasant or unpleasant content; for instance, thoughts of success are mood-congruent in a happy mood. Mood-congruent memory is said to occur when mood-congruent material is better learned and recalled than mood-incongruent material. That is, mood-congruent memory occurs when happy people better learn and recall positive information (e.g., success) relative to negative information (e.g., failure), and sad people show the reverse effect. This mood-congruent memory effect may be closely related to another effect, termed *mood-congruent judgment*. The mood-congruent judgment effect states that mood-congruent material will be judged as possessing "greater merit" in many ways. For example, a happy person will judge positive events as more likely to occur than negative events, pleasant examples as more representative of categories than unpleasant examples, and positive thoughts as possessing higher imagery than negative thoughts. Because mood-congruent memory and judgment are believed to be related, the two effects will often be compared in this article.

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Mood-congruent memory and judgment are said to occur because of a connection between mood and memory that is often described in terms of a spreading-activation model of memory (Collins & Loftus, 1975). A spreading-activation model describes the memory system as consisting of interconnected nodes in a network; most nodes represent cognitive concepts. According to one influential version of the theory (Bower, 1981), a subset of such nodes represents individual moods such as happiness and sadness. As a person enters a given mood, the mood's correspondent node in memory is activated, and that activation spreads to associated concepts, thereby assisting in the encoding and/or retrieval of mood-associated ideas (which are typically mood congruent). Happy people will, therefore, better recall pleasant material; sad people will better recall unpleasant material. Under such conditions the effect is said to be symmetrical in happy and sad moods. Sometimes, however, sad people are said to divert their attention to pleasant material so as to repair their moods, thereby learning pleasant and unpleasant material equally (Blaney, 1986; Isen, Shalker, Clark, & Karp, 1978; Mayer, Gayle, Meehan, & Haarman, 1990). In this case the effect is considered asymmetrical because it occurs in happy moods only. Explanations for mood-congruent judgment are sometimes appended to such spreading-activation descriptions. For example, biased memories for past events are said to bias judgments about the future that are based on such memories (Bower, 1981).

Attempts to demonstrate the mood-congruent memory effect with natural mood have yielded consistently negative results, although the effect has been demonstrated with experimental mood inductions. Such failures to obtain mood-congruent memory with natural mood have undermined confidence in the effect and made it appear separate from mood-congruent judgment, which is regularly found in natural mood (Mayer, Gaschke, Braverman, & Evans, 1992; Mayer & Hanson, 1995). As a consequence, several alternatives to spreading-activation theory have been proposed that explain the judgment effect independent of the memory effect (Forgas, 1992a; Mayer et al., 1992; Schwarz & Clore, 1983). The present research program attempts to bolster evidence for mood-congruent memory by producing it with natural mood. Should we find such evidence, a secondary purpose of the research is to compare mood-congruent memory with mood-congruent judgment so as to understand their similarities and differences.

BACKGROUND AND SIGNIFICANCE

The Importance of Converging Operations to the Study of Cognition and Affect

A mood-congruence experiment requires a careful consideration of the nature of mood and its appropriate manipulation. Because mood is a complex concept, any one of several operations may be employed to study it: (a) Moods may be experimentally induced, which permits random assignment of moods to individuals but may fail to create an ecologically valid version of those moods; (b) psychopathological moods may be studied, which may be strong but are also potentially confounded with mental illnesses; and (c) natural, everyday moods may be surveyed, which sacrifices random assignment of mood but may best capture the dynamic quality of real moods as they are occurring. Because each procedure for studying mood has its unique strengths and weaknesses, converging findings from all the operations would provide the strongest support for mood-congruent memory (Cook & Campbell, 1979, p. 61).

The great strength of experimental mood manipulations is that they can help identify specific causes of effects. Most laboratory mood-and-memory studies begin by manipulating a given participant's mood to make the person either happy or sad, and then measure that person's memory for happy and sad experimental material. A considerable number of learning and memory experiments have employed induced moods with positive results (for reviews, see Fiske & Taylor, 1991; Forgas & Bower, 1988; Singer & Salovey, 1988; Ucros, 1989; for lexical decision studies, see Niedenthal & Setterlund, 1994; Pertsch, 1991). But the mostly positive results have sometimes been criticized because it is said the mood-induction materials (e.g., reading a sad story; seeing a sad film) might have primed the to-be-learned material (Blaney, 1986; Perrig & Perrig, 1988; Riskind, 1989).

Natural-mood approaches are less susceptible to a priming critique because natural moods are caused by a variety of influences including such largely noncognitive influences as the physiological influences of prior emotions, sleep deprivation, odors, foods, biological cycles and rhythms, illness, and characterological makeup (Parkinson & Manstead, 1992). It is likely, of course, that cognitive appraisals of situations bring about some natural moods. Although these cognitive appraisals could, in turn, prime later cognitions, such priming effects should be attenuated because of the memory interference apt to intervene between the situational appraisal and the time participants report for the study (Anderson, 1990, pp. 162-170). Using natural-mood and experimental approaches together helps converge on a more valid conception of the mood-congruent memory effect.

The natural-mood approach also has advantages in relation to clinical studies in which subjects are preselected because of a given psychopathology such as depression. Such clinical studies have sometimes obtained positive findings concerning the effect—that is, that depressed persons learn sad material better (Lloyd & Lishman, 1975; Teasdale & Fogarty, 1979), but the over-

all findings are considered somewhat mixed (Fiske & Taylor, 1991; Singer & Salovey, 1988). Clinical studies are also subject to the criticisms that their effects may be due to psychopathology rather than mood, and also that the selection criteria (e.g., depression scales that inquire as to bad memories) are confounded with the effect (Coyne & Gotlib, 1983). These criticisms are not applicable to natural-mood studies that employ unselected people.

A meaningful step toward disambiguating the mood-congruent memory effect would be taken if mood-congruent memory could be found with unselected individuals in natural mood. Further information could be gained by comparing mood-congruent memory and judgment together in a natural-mood context.

Research on Mood-Congruent Memory in Natural Mood

Tests of mood-congruent memory with natural mood have almost altogether failed to find the effect. This is despite the fact that the range of natural-mood strength is typically as large as that of induced moods (Mayer et al., 1990). In one natural-mood study (Mayer & Volanth, 1985), people recalled preexisting information from semantic memory by listing up to eight examples from each of five prespecified categories (e.g., "types of physical contact"). Two judges then rated each of the subjects' responses for its pleasant-unpleasant content. There was no apparent relation between the pleasant-unpleasant content of subjects' recall and their pleasant-unpleasant mood for the overall sample, $r(196) = .02$, *ns*.[1] At the time of that report, asymmetrical memory effects in happy versus sad moods had not been reported in the research literature with any consistency, and the overall null result preempted further analyses. For the present article, however, we reanalyzed that earlier data and found that when the sample was divided into happy and sad subgroups, the effect was present among happy subjects, $r(100) = .20$, $p < .05$, but not among sad subjects, $r(94) = .01$, *ns*. This reanalysis provided weak support for the effect with natural mood.

A more ambitious attempt to obtain mood-congruent memory with natural mood failed completely (Hasher, Rose, Zacks, Sanft, & Doren, 1985). Subjects in two experiments learned prose passages with both pleasant and unpleasant memory units, recalled them, and reported their mood on several mood scales. There was no difference in pleasant-unpleasant recall between sad and nonsad participants. Although the work of Hasher et al. was criticized at the time (Ellis, 1985; Isen, 1985; Mayer & Bower, 1985), Hasher addressed the most serious of the criticisms in a new experiment and again failed to obtain the effect (Camac & Hasher, 1986). There have been no subsequent instances reported of natural mood-congruent memory.

The inability to reliably obtain mood-congruent memory with natural mood, along with other equivocal findings, undermines the generality of the effect. Such failures suggest that mood-congruent memory is due to priming in experimental subjects and due to psychopathology in the self-concept of depressed subjects. At best, mood-congruent memory remains mysteriously inapplicable to everyday personality. We therefore sought further evidence of mood-congruent recall in natural mood.

PRELIMINARY STUDY

We wondered whether the weak findings of Mayer and Volanth (1985) had been due to the two raters' insufficient accuracy when rating the affective content of the subjects' myriad responses. To eliminate this problem, we conducted a new study with 121 undergraduates at the State University of New York at Purchase in which participants again were asked to list eight examples from each of four categories. Rather than employing raters to evaluate the valence of retrieved items, however, we constructed a table for determining the pleasant-unpleasant quality of commonly listed responses by (a) listing all the responses to each category that appeared among 30 randomly selected booklets and (b) having six raters rate all the words according to the words' pleasant-unpleasantness. One problem with this procedure was that only about 75% of the participants provided even three scorable responses per category, although our scoring table had been based on 30 protocols. Many subjects apparently had been unable to complete the task as instructed and instead had supplied ill-fitting responses so as to appear to comply. Among all subjects the correlation between pleasant-unpleasant memory and pleasant-unpleasant mood was $r(121) = .11$, *ns*, but the correlation between pleasant-unpleasant memory and mood was significant when we employed only those subjects who had provided one or more scorable responses per category, $r(113) = .18$, $p < .05$, or three or more scorable responses per category, $r(90) = .24$, $p < .01$. We conducted further tests for the asymmetrical quality of the effect. The first two scoring methods showed no significant effect for either happy or sad subjects examined separately; the third, most stringent scoring method did show an apparent trend toward superiority of mood congruence in happy moods, $r(45) = 24$, $p < .06$, relative to sad moods, $r(45) = .00$, *ns*. The results of the preliminary study were the most promising thus far in detecting mood-congruent recall with natural mood.

STUDY 1

The results of the preliminary study suggested that retrieval from semantic memory may be congruent with

natural mood. However, improved procedures that raise subjects' compliance level and constrain the to-be-listed members of categories were needed. We developed and tested such a procedure in Study 1. To do this, we asked participants to list a category member that began with a specific letter, rather than leaving the response unconstrained as we had before. This approach is similar to one employed in Slamecka and Graf's (1978) generation procedure.

For example, we asked participants to list "a description of the weather that begins with the letter *s*." We intentionally selected category-letter pairs that would yield responses of differing pleasant-unpleasant tone. "Weather that begins with . . . *s*" could generate the responses *sunny, stormy,* or *snowy,* which are rated on average positively, negatively, and in between. We also designed a second word-association task, in which each stimulus word was followed by two letters and the subject was to write down whichever association to a letter came to mind first (e.g., "Forest: t/f_____").[2] Including the letter prompts should both constrain responses and raise compliance so that a greater proportion of responses could be assigned pleasant-unpleasant rated values. Note also that norming such items as to the dominance of a particular alternative was unnecessary for the goal of assessing relative pleasant-unpleasant retrieval between subjects.

The hypothesis of Study 1 was that the pleasant-unpleasant valence of recall on such a task would correlate with self-reports of pleasant-unpleasant unmanipulated mood.

Method

SAMPLE

The 200 subjects were drawn with instructors' permissions from lower level psychology courses at several local technical and 4-year colleges including Keene State College, McIntosh College, New Hampshire Technical College, and the University System of New Hampshire's College for Lifelong Learning. Subjects participated on a voluntary basis during class time.

MOOD-CONGRUENT MEMORY TASKS

Category-retrieval test. Participants in this task were instructed to list a member of the category that began with the specified letter of the alphabet. For example, they might respond to "Attitude . . . *p*" with *positive, pessimistic,* or *poor.* The category-listing task included 24 category-letter pairs. Scoring was for the pleasantness of response, assigned by a table constructed for that purpose. The table contained all valid responses to a given memory item; each valid response was classified as unpleasant, neutral, or pleasant, and scored 1, 2, or 3, respectively. Examples of items and their scoring are shown in the top portion of the Table 1. A subject's score on a given task was the average rating of all the valid responses the subject made on the task, where higher numbers indicated more pleasant retrieval. Fewer than 1% of the listings were unclassifiable according to the table; these were listed as missing. Happy people were hypothesized to list more pleasant words.

The table was developed by (a) listing all responses to each item by the first 100 subjects of Study 1; (b) making a preliminary assignment of each response to a pleasant, neutral, or unpleasant category (which was done by the second author); (c) reviewing each assignment (which was done by the first author) and discussing possible changes; and then (d) considering input concerning classifications from three independent judges who reviewed all assignments but were essentially in agreement with initial placements.

Association-retrieval test. Participants in the association-listing task were instructed to free-associate to a key word and to list the first association they thought of that began with either of the two letters paired with it. For example, in the case of "Marriage . . . d/l_____," participants might respond with *divorce* or *love.* There were 16 associate/cue-letter pairs. Order of the cue letters for the pleasant and unpleasant responses was scrambled. Scoring was for the pleasantness of the associate, which was scored unpleasant, neutral, or pleasant, (1, 2, or 3, respectively) as described in the categorization memory-task above. A sample of the scored responses is shown in the bottom portion of the Table 1. It was hypothesized that happier people would list more pleasant associates.

Filler task. Study 1 employed a filler task that was a 5-item "personality" questionnaire designed to obfuscate the purpose of the study. It included one item each concerning such mostly unrelated traits as extraversion, interest, and impulsivity.

Mood measure. Mood was measured with the factor-based 16-item pleasant-unpleasant mood scale of the Brief Mood Introspection Scale (BMIS; Mayer & Gaschke, 1988).

PROCEDURE

Subjects were tested mostly in groups, except for a few volunteers who were tested individually. A booklet containing all the test materials and instructions was administered to subjects, who completed it at their own pace and were debriefed. Debriefing for the University of New Hampshire participants was done at the end of a given semester so as to restrict knowledge of the experimental hypotheses in the subject pool.

TABLE 1: Sample Items and the Classification of the Responses to Them

Sample category-retrieval items	
Item: Type of comment . . . N_____	
Scored pleasant	Nice, noble
Scored unpleasant	Nasty, narrow-minded, naughty, negative, neurotic, no, notorious
Scored neutral/ambiguous	Narrative, needless, nonchalant, none, nonsense, nonverbal
Item: Weather . . . C_____	
Scored pleasant	Calm, clear
Scored unpleasant	Chilly, cloudy, cold
Scored neutral/ambiguous	Cool
Sample association-retrieval items	
Item: Marriage . . . D/L_____	
Scored pleasant	Delight, desire, devotion, life, love
Scored unpleasant	Damned, death, divorce, dumb, dull, lame
Scored neutral/ambiguous	Daddy, license, lifetime, linger, long
Item: Bee . . . H/S_____	
Scored pleasant	Helpful, honey, sweet
Scored unpleasant	Hornet, horsefly, hurt, sting
Scored neutral/ambiguous	Hive, hover, huge, hum, small

Results and Discussion

MOOD MEASURE AND MOOD GROUPS

The pleasant-unpleasant mood scale on the BMIS is calculated by subtracting ratings on the eight unpleasant mood adjectives from the eight pleasant ones (each rated on a 4-point scale; Mayer & Gaschke, 1988). This yields an essentially normally distributed set of scores around a mean typically 5 to 7 points above the zero point, reflecting the fact that most people report themselves as slightly more happy than sad on this and other scales (e.g., Mayer et al., 1990). As in prior research (e.g., Mayer et al., 1992; Mayer, Mamberg, & Volanth, 1988), we employed the within-sample mean as the group cutpoint and created roughly even-sized above- and below-average mood groups (exactly even groups are usually not possible, even using a median cutpoint, as many people obtain each possible score near the middle of this brief scale). We will refer to these above- and below-average groups as happy and sad groups to be consistent with prior literature. Although the mean of the sad groups in this and subsequent studies in the article is near neutral on the mood scale, such neutral reports likely reflect actual unhappiness, given that people positively bias their self-reports in many ways (e.g., Matlin & Stang, 1979) and that these individuals are below average in an unselected sample of college students. The average mood in natural-mood studies is, however, likely to be somewhat happier than in mood-induction studies because experimental mood inductions are generally more effective for sad than happy moods (e.g., Mayer et al., 1990). The reliability of the pleasant-unpleasant scale of the BMIS was $r(200) = .84$ in Study 1 and was at a comparable level in the subsequent studies, so it will not be further reported.

RETRIEVAL TASKS AND THEIR RELATION TO MEMORY

Cognitive-style scales are more complex than self-report measures such as the BMIS. It is likely that such cognitive-style scales primarily detect reliable variance concerning cognitive qualities such as general intelligence and memory, and only secondarily register variance because of the cognitive styles in question (in this case, pleasant-unpleasant recall). For this reason, the present cognitive-style scale can be expected to have low reliability for measuring pleasant-unpleasant recall. The reliability was $r = .33$ for the 24-item category-retrieval task, $r = .44$ for the association task, and $r = .48$ for the combined scales. These are adequate for this research.

The main hypothesis of Study 1 was that pleasant-unpleasant retrieval would correlate with mood. Pleasant-unpleasant memory measured by category retrieval correlated with mood, $r(200) = .18$, $p < .01$, measured by association retrieval correlated with mood, $r(200) = .23$, $p < .01$, and for the combined measures was $r(200) = .27$, $p < .01$. We further split the sample at a mood z score of zero. On the whole, mood-memory correlations existed within the happy-mood group but not in the sadder-mood group. This breakdown can be seen in Table 2.

The improved procedure of Study 1 yielded unambiguously positive relations between mood and memory for the sample considered as a whole, and for happy participants in particular. These unambiguously positive findings came as a surprise to us, given the past negative results in the field. We, therefore, attempted to replicate them in Study 2 and also added a mood-congruent judgment scale for purposes of comparison.

TABLE 2: Descriptive Statistics and Correlations With Mood, Studies 1, 2, and 3

Study Aspects		*Descriptive Statistics*			*Correlations With Mood*					
					Memory Scales			*Judgment Scales*		
Study	*Sample Division*	*Sample Size*	*Mood Mean*	*Level SD*	*Category Retrieval*	*Association Retrieval*	*Combined*	*Category Retrieval*	*Association Retrieval*	*Combined*
One	Total	200	5.4	7.6	.18**	.23**	.27**	—	—	—
	Happy	99	11.6	4.5	.27**	.32**	.39**	—	—	—
	Sad	101	−.7	4.4	.14	.07	.13	—	—	—
Two	Total	221	5.9	8.0	.08	.16**	.16**	—	—	.32***
	Happy	110	12.4	4.4	.27**	.21*	.30**	—	—	.29***
	Sad	111	−.6	4.8	−.03	−.06	−.06	—	—	.18*
Three	Total	193	7.7	7.2	.21**	.25**	.29**	.42**	.16*	.37**
	Happy	102	13.7	3.8	.06	.17*	.14	.22*	.15	.23*
	Sad	91	1.0	5.0	.25*	.14	.25**	.27**	.03	.21*

*$p < .05$; **$p < .01$; ***$p < .005$ (one-tailed).

STUDY 2

The method of Study 2 was identical to that of Study 1 except for the addition of a scale of mood-congruent judgment for purposes of comparison.

Method

Sample. The 223 students were drawn from Keene State College and from the introductory psychology subject pool at the University of New Hampshire. Subjects from Keene State participated on a voluntary basis during class time; those from the University of New Hampshire were tested in group sessions outside of class and given credit toward their course requirements.

Materials. The same 24-item tests of categorical retrieval (e.g., "Weather that begins with . . . s_____") and association retrieval (e.g., "Forest . . . t/f_____") employed in Study 1 were repeated without change.

In addition, we added a 12-item factor-based measure of mood-congruent judgment (Mayer & Hanson, 1995) to compare the mood-memory and mood-judgment effects.

Procedure. The procedure was identical to that of Study 1.

Results and Discussion

The results of Study 2 replicated and extended those of Study 1. The coefficient alpha reliabilities of the category, association, and combined tasks were $r = .43$, .34, and .50, respectively. A split-half reliability for the judgment scale (used instead of coefficient alpha because of the heterogeneous item structure) was $r = .41$. As can be seen in Table 2, correlations between memory and mood were once again definitely present, although a bit lower than in Study 1. This time, for example, the correlation between the combined memory-retrieval tasks and mood was $r = .16$, $p < .01$. Once again, when we divided the sample in half at a mood z score of zero, the happy group showed the effect more strongly than the sad group. The judgment scale also correlated with mood at $r = .32$, $p < .005$, for the whole sample, and operated at similar levels for both the happy and sad subgroups.

Studies 1 and 2 made it clear that pleasant-unpleasant memory and mood do covary. In addition, there is evidence that the effect occurs more strongly in positive than negative moods. The results of Study 2 suggested that the mood-congruent judgment effect was stronger than the memory effect, but because the memory and judgment scales were not designed to be parallel to one another, it was not possible to make an entirely meaningful comparison. Better comparisons between mood-congruent memory and judgment were made in Study 3 in which test materials were modified for that purpose.

STUDY 3

Study 3 continued an examination of mood-congruent memory and judgment. In Study 3, we constructed pleasant-unpleasant judgment items partially parallel to the pleasant-unpleasant memory items, so as to better compare them. For example, if a category-retrieval item read, "What is an example of physical contact that begins with h_____?" the parallel judgment item would read, "What is the best example of a type of physical contact: (a) kiss, (b) kick, (c) karate" (the cue-letter was changed so as avoid direct repetition). The partially parallel memory and judgment items could then be directly compared as to their relative strength in correlating with pleasant-unpleasant mood.

A secondary purpose of Study 3 was to reduce the lengths of the tests so that they would be more convenient to use in the future. Among tests constructed of homogeneous (i.e., parallel) test items, shorter tests can

be expected to lower the test's reliability (e.g., Nunnally, 1978, pp. 210-212). Although shortening our tests would lower reliability, the predictive validity of the test—that is, as indicated by the correlation between memory and mood—might be relatively unaffected. Mathematically, predictive validity is only moderately diminished by drops in reliability (Burisch, 1984). Moreover, because mood change during the test taking is a potential source of error that would be minimized for shorter scales, reducing such changes could counteract drops in reliability and actually improve the validity of the test. We, therefore, sought to develop very short memory scales in Study 3. Hypotheses remained the same as in Studies 1 and 2.

Method

SAMPLE

The 193 students were drawn from the subject pool of the University of New Hampshire.

MATERIALS

Category- and association-retrieval tasks. The category- and association-retrieval tasks were repeated from Studies 1 and 2, but shortened to 12-item scales. To construct the two 12-item category- and association-retrieval scales, we factor-analyzed data from Study 2 that employed the full-length versions of each, and chose the 12 highest loading items on the category-retrieval task's pleasant-unpleasant retrieval factor and the 12 highest-loading items on the association-retrieval task's parallel factor. These items formed the two new 12-item scales. In a pilot study employing exactly the same design and procedure as here, we had employed 6-item scales, but these proved too low in reliability to provide a fair test of the mood-congruent memory effect (see Note 3 below for further details).

Category judgment. As described above, the category-retrieval test measures mood-congruent memory by asking participants to retrieve such concepts as "An attitude that begins with the letter *s*." For the category-judgment test, which was intended to measure mood-congruent judgment, items partially parallel to those of the retrieval test were written. For example, the judgment item parallel to the above memory item was "What is the best example of an *Attitude*: (a) optimistic, (b) ornery, or (c) oppositional?" Item stems were identical to those employed in the memory tasks; initial letters of the responses were changed, however, so that the memory and judgment versions of the task did not directly contaminate one another. The participant's job was to judge which already-provided alternative was the best example of a category rather than to retrieve examples from memory as they had in the memory version of the task. Scoring was for the prerated pleasantness of the alternative chosen. Happy people were hypothesized to select more pleasant words. Twelve judges (six men, six women) rated all the 36 item alternatives (12 items × 3 alternatives) as to their pleasantness-unpleasantness, and the judge's average rating was assigned as the pleasant-unpleasant score for a particular judgment alternative.

Association judgment. Analogous to the above, the judgment version of the association-listing task contained items of the form "What is the closest association to *Marriage*? (a) fight, (b) family, or (c) wedding." That is, the participant was to judge which already-provided associate was best rather than producing them as they had done in the retrieval version of the task. Item stems were identical to those employed in the memory tasks; initial letters were changed, however, so that the responses to the correspondent stems in the memory and judgment versions of the task did not directly contaminate one another. Scoring was for the prerated pleasantness of the alternative chosen, as described in the categorization-judgment task above. Happy people were hypothesized to select more pleasant words.

PROCEDURE

Study 3 procedures were the same as before except that two orders of testing were employed: (a) memory, judgment, and mood scales and (b) judgment, memory, and mood scales. Because results indicated that there were no differences between these two orders of administration, analyses are reported for the study as a whole.

Results and Discussion

The 12-item versions of the memory tasks we employed proved fairly reliable (coefficient alpha reliabilities: category retrieval $r = .20$; association retrieval $r = .18$; and combined $r = .32$). The revised, 12-item judgment scales, written to be parallel with the memory scales, were much higher in reliability (coefficient alphas: category judgment $r = .58$; association judgment $r = .24$; and combined $r = .62$). Both pleasant-unpleasant memory and judgment scales correlated with mood for the overall sample. For example, the combined memory task correlated with mood, $r = .29$, $p < .005$, for the full sample. The correspondent judgment correlation was $r = .37$, $p < .005$. Further details can be seen in Table 2, which also shows a higher mood-memory connection in the sad- than in the happy-mood subgroup—the opposite asymmetry to that present in Studies 1 and 2.

IS THE MOOD-CONGRUENT MEMORY EFFECT WEAKER THAN THE MOOD-CONGRUENT JUDGMENT EFFECT?

We next compared the relative strengths of the mood-congruent memory effects and mood-congruent judgment effects. As noted above, in a pilot version of Study 3, we had employed 6-item rather than 12-item parallel

versions of the memory and judgment scales. The pilot data can be pooled with the data from the present study so as to increase the power of the following comparisons. Note 3 provides a fuller report of the pilot-study results.[3]

Over the pilot and present versions of Study 3, the average correlation for the combined memory tasks with mood was $r(410) = .17$, $p < .001$, which was significantly lower than that for judgment, $r(410) = .29$, $p < .001$; $t(408) = 2.04$, $p < .05$. This lower correlation for memory is no doubt one reason that memory effects have been harder to obtain than judgment effects with natural mood.

But the lower correlation between memory and mood, compared to judgment, may be a function not of a weaker relationship but of the memory tests' lower reliabilities. The memory retrieval tests combined across the category and association tasks for both the pilot and present versions of Study 3 had a reliability that was significantly lower than that of the essentially parallel judgment scales, $r(190) = .18$ versus $r(413) = .50$, respectively; $z(601) = 4.2$, $p < .001$ (only complete protocols were analyzed, and the lower n for memory reflected the greater likelihood of missing items). If memory's lower correlation with mood were solely a function of lower reliability, then mood-congruent memory and judgment should exhibit the same size effects if they were measured with equal reliability. The *correction for attenuation* (Nunnally, 1978, pp. 237-238; Spearman, 1904) yields the estimated mood-memory and mood-judgment correlations that would be present were the tasks equivalently and perfectly composed of reliable pleasant-unpleasant variance. Making these corrections for the combined tasks in the pilot and present versions of Study 3 yielded new estimates of $r = .43$ for mood and memory, and $r = .46$ for mood and judgment. They certainly seem equivalent in value, although there is no agreed upon way of testing the difference between two repeated-measure disattenuated correlation coefficients. The meaning of this finding is discussed in greater detail below.

GENERAL DISCUSSION AND CONCLUSIONS

In the past, the existence of the mood-congruent memory effect has been undermined by the fact that it has never been demonstrated with everyday moods. The present studies provide very strong evidence that mood-congruent memory does occur with everyday natural mood. The correlation between pleasant-unpleasant memory retrieval and mood was found across two independent tasks in all three studies. This is a potentially very general effect. Together, these studies suggest that every time a person retrieves an example of a category or associates one concept to another, that person's memory will be biased by mood. This suggests, for example, that associations to ideas required in many forms of communication, such as teaching, literature, and film, may be influenced by the person's mood at the moment those ideas are retrieved. Moreover, the present evidence would support the argument that depressed persons recall more negative life events than others in part because of memory rather than only because of an unhappier life.

Reasons for the Present Positive Findings and Qualifications

The present studies succeeded in finding mood-congruent memory with natural mood because they were different in two sorts of ways from earlier studies that failed. The first difference involved setting up the general conditions under which natural-mood effects are most likely to be obtained. These included (a) correlating a single pleasant-unpleasant dimension of mood with a single pleasant-unpleasant dimension of the cognitive response being studied, (b) counterbalancing items as to valence where necessary, (c) keeping close temporal proximity between the task and mood measure, and (d) employing items that are vague and/or ambiguous (Mayer & Hanson, 1995). We also have obtained our positive findings by (e) testing participants on mood-and-cognition tasks shortly after those individuals enter a given setting (e.g., laboratory, classroom, etc.) and before they encounter other tasks that may include mood-biasing material, or that may be so lengthy as to subdue or aggravate their moods.

But simple adherence to these general rules was insufficient to obtain the memory effect in our laboratory in the past. The second set of differences was more specific to the requirements of studying memory with natural mood and involved employing test items that were better in several respects than those used in the past. For example, the test items used here were more independent of one another than some of those used in the past. By comparison, the connected-discourse items studied by Hasher et al. (1985) often juxtaposed pleasant and unpleasant ideas within the same sentence of the story, thereby creating interconcept connections between them. Such cuing from pleasant to unpleasant and back again may reduce the potential role that mood can play in retrieval (Mayer & Bower, 1985). A second advantage of the present items is that the letter-cue format is much easier for participants to complete than are uncued items; such ease of completion leads to better compliance than in earlier studies (i.e., Mayer & Volanth, 1985), leading to less error variance in the data. Finally, this same item format restricts the universe of legitimate answers for each item, such that each response can be individually and uniformly coded as to its pleasant-

unpleasant quality; this maximizes the accuracy with which each individual response is assessed.

It remains possible that the mood-memory relations found here are not due to mood but rather can be attributed to long-term dispositions such as neuroticism or depression that, for example, might cause both negative mood and negative memory. Now that a technique exists for reliably measuring mood-congruent memory with natural mood, it will be possible to carry out longitudinal studies that can be used to determine whether it is specifically mood that is the responsible factor for such biases. The covariation between pleasant-unpleasant mood and other forms of cognition has recently been demonstrated longitudinally for pleasant-unpleasant judgment (Mayer & Hanson, 1995).

A Comparison of Mood-Congruent Memory and Judgment

We recently argued that mood-congruent judgment is a broad effect occurring across a variety of moods, tasks, people, and settings (Mayer et al., 1992). We must now face the difficult task of deciding whether there is one even broader mood-congruent cognition effect that encompasses both judgment and memory, or whether these are two distinct effects. One way to distinguish the effect is according to size. Our analyses indicated that mood-congruent memory and judgment are equally strong in effect, but that mood-congruent memory items tend to be less reliable. It would be wrong to conclude that the two effects are different because they differ in reliability. The necessarily open-ended form of the memory retrieval items as compared to judgment items means that a broader spectrum of possible responses might occur for each memory item; this by itself could account for the lower reliability of the memory items, relative to the judgment items. Therefore, the two effects cannot be distinguished by their effect size.

Symmetry Versus Asymmetry in Memory

Another way to distinguish mood-congruent memory from judgment might be according to their symmetry. Recall that asymmetry is believed to be caused by sad people who think happy thoughts to regulate their moods, and who thereby override the usual mood-memory connection. It is worth noting that natural-mood studies differ from experimental studies in their operationalizations of symmetry. In experimental studies, equal numbers of pleasant and unpleasant words (or sentences, etc.) are learned, and symmetry is present when happy people recall more positive than negative words and sad people recall the reverse. Should sad people recall happy and sad words *equally*, then asymmetry would be said to be present. By comparison, in natural-mood studies, in which there is no control over prior learning, symmetry is said to be present when happy- and sad-mood groups have equivalent correlations between memory valence and mood; asymmetry refers to larger correlations in either happy- or sad-mood groups. That is, within the happy group, the happier people show favoritism for the pleasant stimuli, but within the sad group, there is no relation between sadness and recall of stimuli (because sad subjects override the effect to repair their moods). One additional difference of note is that the participants in natural-mood studies may be happier overall than in mood-induction studies, because induction studies typically employ sad inductions that outperform happy inductions.

That said, the present studies contradicted one another concerning whether mood-memory effects are symmetrical or asymmetrical. The reanalysis of Mayer and Volanth (1985), the preliminary study, and Studies 1 and 2 all provide evidence consistent with the mood-induction literature that mood-congruent memory is stronger in happy than sad moods; Study 3, however, shows the reverse. The reversal does not depend on stimulus materials, because exactly the same memory items that were asymmetrical in Studies 1 and 2 reversed in Study 3. Because one explanation of asymmetry involves mood regulation, it might be possible that more diverse tasks of Studies 1 and 2 (which included filler tasks) gave sad subjects time to think happy thoughts, whereas the extremely brief tasks of Study 3 delayed any mood regulatory processes until after the experiment was complete. If so, then it might be possible to manipulate opportunities for mood regulation to see whether symmetry is affected. Another tempting explanation is that the reversal of asymmetry in Study 3 is simply due to sampling variance. Perhaps it is unsurprising that we were unable to resolve an issue that has been unresolved over a decade of research; teasing out these possibilities will require still further studies.

Evidence for One Mood-Congruence Effect That Involves Both Memory and Judgment

The finding that mood-congruent memory and judgment both occur with natural mood, and that they are roughly the same size when adjusted for their different reliabilities, increases the likelihood that one spreading-activation-type model (Bower, 1981) can account for the present results. According to this theory, mood biases memory, and memory, in turn, biases judgments. Converging evidence from a number of other studies increases the likelihood of this explanation (e.g., Forgas, 1992b; Niedenthal & Setterlund, 1994). Although the present findings clearly support such a model, it is also the case that because mood-congruent memory and judgment can both be studied under conditions of natural mood, further comparisons between them can be

conducted. For example, features such as their factor structure, their change over time, and their respective symmetry and asymmetry may improve our understanding as to the adequacy of a spreading-activation model to account for them both.

Personality Implications of Mood-Congruent Retrieval From Semantic Memory

Many implications of mood-congruent judgment to personality outlined in other articles also apply to mood-congruent memory. These implications concern greater creativity and better planning under uncertainty for those who undergo mood swings (Mayer, 1986; Mayer et al., 1992; Mayer & Hanson, 1995), the better regulation of motivations among those who exhibit mood-congruent effects (Mayer et al., 1992), and considerable characterological issues for those who are predominantly happy or sad (Mayer et al., 1988; Mayer & Volanth, 1985). Concerning the last point, those who are predominantly sad will generate a stream of negative memory retrieval. For example, depressed persons who predominantly recall their spouses' negative acts, unintelligent comments, and moments of unattractive appearance may place their marriages in jeopardy because of a cognitive illusion.

Transient, sad-mood-biased retrieval is, however, not necessarily negative. Bad moods often represent information that something is going wrong. Always reacting by thinking happy thoughts would lead a species to die out quickly because the world is a somewhat intolerant place. Humans more often change from unhappy to happy feelings by taking some action. Thus persons in a bad mood may desire to understand how they became sad and how to improve their feelings. Now, say that a person enters a bad mood because of a fight with a spouse. The flood of negative memories that will arise should contain connections to transition points—associations between prior negative feelings and the past actions that led one to feel better. A person may remember that saying a nice thing to a spouse (or discussing the problem with the spouse, etc.) led to a better future relationship. Once the person has recalled those potential transitional actions, the individual is in a position to reenact those plans that have worked to improve mood in the past. From this perspective, extra negative recall, although potentially leading to hopelessness (e.g., Abramson, Metalsky, & Alloy, 1989), may also help retrieve effective solutions to problems.

The interaction of mood and memory (and judgment) is an example of how different components of personality operate on each other, often in partial independence of intentional self-direction or specific outside influences. The breadth of the mood-memory interactions studied here is substantial; mood exerts slight but detectable influences on the average freely chosen memory and ambiguous judgment made by the individual. Such connections reinforce the contemporary understanding of personality as a complex system subject to a variety of potential internal and external influences. In addition to control from the conscious self, or from the outside, some personality control is distributed across its own internal systems. Although this distributed control is internal and involves interactions, it can be productively studied and understood, and can enrich our understanding of personality structure.

NOTES

1. One earlier study measured mood-congruent recall as the difference in the number of items listed in response to positive (e.g., "works of art") and negative (e.g., "weapons") categories (Mayer & Bremer, 1985). The pleasant and unpleasant categories failed to elicit uniformly pleasant and unpleasant members. People responded to "works of art" with responses such as Dante's *Inferno*, which have at least partially negative connotations. There were no significant findings for mood-congruent recall.

2. We conducted three pilot studies that employed about 20 individuals each so as to develop both category listings and word-association versions of the tasks. The single-letter form of the word-association task resulted in items that typically drew a single, near-universal association. We, therefore, altered the task so that each stimulus word was followed by two letters and the subject was to write down whichever association to a letter came to mind first.

3. Analyses of the pilot study conducted for Study 3 with 6-item rather than 12-item scales ($N = 219$) indicated that the 6-item versions of the memory tasks reduced their reliability further than intended, to near total unreliability (coefficient alpha reliabilities: category retrieval $r = .12$; association retrieval $r = -.01$; combined $r = .11$). The reliabilities were so low that there were no significant correlations between the memory tasks and mood—total sample $r(219) = .00$; happy $r(104) = -.01$; sad $r(115) = .09$; all *ns*. In contrast, the 6-item judgment scales, written to be parallel with the memory scales, were much higher in reliability (coefficient alphas: category judgment $r = .32$; association judgment $r = .33$; combined $r = .36$). As a consequence they correlated with mood even in their 6-item form, $r(219) = .22$, $p < .01$; happy $r(104) = .13$, *ns*; sad $r(115) = .15$, *ns*. These results followed the same pattern as in the 12-item version of Study 3. See text for an interpretation of the results.

REFERENCES

Abramson, L. Y., Metalsky, G. I., & Alloy, L. B. (1989). Hopelessness depression: A theory-based subtype of depression. *Psychological Review, 96*, 358-372.

Anderson, J. R. (1990). *Cognitive psychology and its implications* (3rd ed.). New York: W. H. Freeman.

Angyal, A. (1941). *Foundations for a science of personality*. New York: Viking.

Barratt, E. S. (1985). Impulsiveness defined within a systems model of personality. In C. D. Spielberger & J. N. Butcher (Eds.), *Advances in personality assessment* (Vol. 5, pp. 113-132). Hillsdale, NJ: Lawrence Erlbaum.

Blaney, P. H. (1986). Affect and memory: A review. *Psychological Bulletin, 99*, 229-246.

Bower, G. H. (1981). Mood and memory. *American Psychologist, 36*, 129-148.

Burisch, M. (1984). You don't always get what you pay for: Measuring depression with short and simple versus long and sophisticated scales. *Journal of Research in Personality, 18*, 81-98.

Camac, M., & Hasher, L. (1986, August). Mood and memory for prose: Another look. In P. Blaney (Chair), *Mood and memory: Current research issues*. Symposium conducted at the 94th annual convention of the American Psychological Association, Washington, DC.

Collins, A. M., & Loftus, E. F. (1975). A spreading-activation theory of semantic processing. *Psychological Review, 82*, 407-428.

Cook, T. D., & Campbell, D. T. (1979). *Quasi-experimentation: Design & analysis issues for field settings*. Chicago: Rand McNally.

Coyne, J. C., & Gotlib, I. H. (1983). The role of cognition in depression: A critical appraisal. *Psychological Bulletin, 94*, 472-505.

Ellis, H. C. (1985). On the importance of mood intensity and encoding demands in memory: Commentary on Hasher, Rose, Zacks, Sanft, and Doren. *Journal of Experimental Psychology: General, 114*, 392-395.

Fiske, S. T., & Taylor, S. E. (1991). *Social cognition* (2nd ed.). New York: McGraw-Hill.

Forgas, J. P. (1992a). Affect in social judgments and decisions: A multiprocess model. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 25, pp. 227-275). New York: Academic Press.

Forgas, J. P. (1992b). On mood and peculiar people: Affect and person typicality in impression formation. *Journal of Personality and Social Psychology, 62*, 863-875.

Forgas, J. P., & Bower, G. H. (1988). Affect in social judgments. *Australian Journal of Psychology, 40*, 125-145.

Hasher, L., Rose, K. C., Zacks, R. T., Sanft, H., & Doren, B. (1985). Mood, recall, and selectivity effects in normal college students. *Journal of Experimental Psychology: General, 114*, 104-118.

Isen, A. M. (1985). The asymmetry of happiness and sadness in effects on memory in normal college students. *Journal of Experimental Psychology: General, 114*, 388-391.

Isen, A. M., Shalker, T. E., Clark, M., & Karp, L. (1978). Affect, accessibility of material in memory, and behavior: A cognitive loop? *Journal of Personality and Social Psychology, 36*, 1-12.

Lloyd, G. G., & Lishman, W. A. (1975). Effect of depression on the speed of recall of pleasant and unpleasant experiences. *Psychological Medicine, 5*, 173-180.

Matlin, M., & Stang, D. (1979). *The Pollyanna principle: Selectivity in language, memory, and thought*. Cambridge, MA: Schenkman.

Mayer, J. D. (1986). How mood influences cognition. In N. E. Sharkey (Ed.), *Advances in cognitive science* (Vol. 1, pp. 290-314). Chichester, England: Ellis Horwood.

Mayer, J. D. (1993-1994). A system-topics framework for the study of personality. *Imagination, Cognition, and Personality, 13*, 99-123.

Mayer, J. D. (in press). A classification system for the components of personality. *Journal of Personality*.

Mayer, J. D., & Bower, G. H. (1985). Naturally occurring mood and learning: Comment on Hasher, Rose, Zacks, Sanft, and Doren. *Journal of Experimental Psychology: General, 114*, 396-403.

Mayer, J. D., & Bremer, D. (1985). Assessing mood with affect-sensitive tasks. *Journal of Personality Assessment, 49*, 95-99.

Mayer, J. D., & Gaschke, Y. (1988). The experience and meta-experience of mood. *Journal of Personality and Social Psychology, 55*, 102-111.

Mayer, J. D., Gaschke, Y. N., Braverman, D. L., & Evans, T. (1992). Mood-congruent judgment is a general effect. *Journal of Personality and Social Psychology, 63*, 119-132.

Mayer, J. D., Gayle, M., Meehan, M. E., & Haarman, A. K. (1990). Toward better specification of the mood-congruency effect in recall. *Journal of Experimental Social Psychology, 26*, 465-480.

Mayer, J. D., & Hanson, E. (1995). Mood-congruent judgment over time. *Personality and Social Psychology Bulletin, 21*, 237-244.

Mayer, J. D., Mamberg, M. H., & Volanth, A. J. (1988). Cognitive domains of the mood system. *Journal of Personality, 56*, 453-486.

Mayer, J. D., & Volanth, A. J. (1985). Cognitive involvement in the mood response system. *Motivation and Emotion, 2*, 261-275.

Niedenthal, P. M., & Setterlund, M. B. (1994). Emotional congruence in perception. *Personality and Social Psychology Bulletin, 20*, 401-411.

Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). New York: McGraw-Hill.

Parkinson, B., & Manstead, A.S.R. (1992). Appraisal as a cause of emotion. *Review of Personality and Social Psychology, 13*, 122-149.

Perrig, W. J., & Perrig, P. (1988). Mood and memory: Mood-congruity effects in absence of mood. *Memory and Cognition, 16*, 102-109.

Pertsch, L. J. (1991). *The relation between mood and the accessibility of cognitive structures: Retesting the priming hypothesis*. Unpublished doctoral dissertation, Department of Psychology, University of New Hampshire, Durham.

Pervin, L. A. (1990). A brief history of modern personality theory. In L. A. Pervin (Ed.), *Handbook of personality: Theory and research* (pp. 3-18). New York: Guilford.

Riskind, J. H. (1989). The mediating mechanisms in mood and memory: A cognitive-priming formulation. *Journal of Social Behavior and Personality, 4*, 173-184.

Schwarz, N., & Clore, G. L. (1983). Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states. *Journal of Personality and Social Psychology, 45*, 513-523.

Singer, J. A., & Salovey, P. (1988). Mood and memory: Evaluating the network theory of affect. *Clinical Psychology Review, 8*, 211-251.

Slamecka, N. J., & Graf, P. (1978). The generation effect: Delineation of a phenomenon. *Journal of Experimental Psychology: Human Learning and Memory, 4*, 592-604.

Spearman, C. (1904). The proof and measurement of association between two things. *American Journal of Psychology, 15*, 72-101.

Teasdale, J. D., & Fogarty, S. J. (1979). Differential effects of induced mood on retrieval of pleasant and unpleasant events from episodic memory. *Journal of Abnormal Psychology, 88*, 246-257.

Ucros, C. G. (1989). Mood state-dependent memory: A meta-analysis. *Cognition and Emotion, 3*, 139-169.

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