

Running head: HAPPINESS AND THE MALLEABILITY OF EVENT MEMORY

Painting with Broad Strokes:

Happiness and the Malleability of Event Memory

Linda J. Levine

University of California, Irvine

Susan Bluck

University of Florida

Abstract

Individuals often feel that they remember positive events better than negative ones, but do they? To investigate the relation between emotional valence and the malleability of memory for real world events, we assessed participants' emotions and memories concerning the televised announcement of the verdict in the murder trial of O. J. Simpson. Memory was assessed for actual events and plausible foils. Participants who were happy about the verdict reported recalling events with greater clarity after two months, and recognized more events after a year, than participants whose reaction to the verdict was negative, irrespective of whether the events had occurred or not. Signal detection analyses confirmed that the threshold for judging events as having occurred was lower for participants who were happy about the verdict. These findings demonstrate that the association between happiness and reconstructive memory errors, previously shown in laboratory studies, extends to memory for real world events and over prolonged time periods.

Painting with Broad Strokes:

Happiness and the Malleability of Event Memory

Research on autobiographical memory has shown that, in general, positive life events are remembered slightly better than negative life events (Walker et al., 2003). For example, Walker, Vogl, and Thompson (1997) had participants keep diaries for three months and rate the pleasantness or unpleasantness of recorded events. At the end of the three months, participants again rated the events for pleasantness and also rated how well they remembered them. The results showed that pleasant events were remembered better than unpleasant events. The degree of pleasantness associated with events, both initially and at the time of retrieval, predicted participants' memory clarity ratings. A closer look at this literature though shows a puzzling finding. When people are asked to make subjective memory judgments, they typically indicate that events that evoked positive emotion are more clearly remembered (e.g., Matlin & Stang, 1978; Thompson et al., 1996; Walker et al., 1997), or come to mind more quickly (Master, Lishman, & Smith, 1983), than events that evoked negative emotion. When researchers look at the objective accuracy of people's accounts, however, they sometimes find no valence effect (e.g., Holmes, 1970), or superior memory for negative events (e.g., Banaji & Hardin, 1994; Bluck & Li, 2000; Kreitler & Kreitler, 1968). Thus, it appears that people may believe they remember happy events more clearly than they really do.

One explanation for these conflicting findings is suggested by recent work on the differing information processing strategies associated with positive and negative emotion. Researchers have argued that people feel happy when goals are achieved and there is no immediate problem to be solved. Because general knowledge is typically adequate for maintaining a state of well being in such circumstances, people tend to draw freely on general

knowledge when they feel happy. In contrast, negative emotions are experienced when goals are threatened or have failed. People in a negative mood tend to engage in effortful processing, evaluating information in a careful, systematic manner and relying less on general knowledge and heuristics. Thus emotional valence, which reflects whether or not there is a problem to be solved, is thought to influence people's information processing strategies (for a review see Bless & Schwarz, 1999).

A growing body of laboratory research in social psychology is consistent with this view. In several studies, people have been put in a positive or negative mood and then asked to evaluate the strength of arguments. The results indicate that happy people are influenced more by prior beliefs or heuristics (such as the belief that experts produce better arguments than novices) than are people in neutral or sad moods who in turn attend more to the specific content of arguments to evaluate their quality (e.g., Bless et al., 1990; Mackie & Worth, 1989). Similarly, when asked to judge other people's culpability or personality attributes, happy people rely more on general knowledge (Fiedler, Asbeck, & Nickle, 1991), stereotypes (Bodenhausen, Kramer, & Susser, 1994), or heuristics (Forgas, 2002) than do people in a neutral or negative mood. Happiness also has been shown to facilitate flexibility and creativity in categorization and other problem-solving tasks (e.g., Isen, Daubman, & Nowicki, 1987; Fredrickson, 2001). In contrast, people in negative moods tend to process information in a data-driven manner and are more conservative in their judgments.

Recent findings indicate that the differing information processing strategies associated with positive and negative emotion also affect memory. For example, Bless and his colleagues induced a happy or sad mood in participants, and then presented them with information about common activities such as eating at a restaurant (Bless et al., 1996). Some of the information was

script typical (e.g., "the hostess placed the menus on the table"), and some was script atypical (e.g., "he put away his tennis racket"). Participants were later given a surprise recognition test that included both previously presented and new information. They found that happy participants were more likely than sad participants to "recognize" script typical information, independent of whether or not the information had actually been presented. Sad participants were more conservative, and more accurate, in their recognition judgments. Park and Banaji (2000) found that happy participants showed a bias toward greater leniency in recognizing ethnic names as members of stereotypical categories, leading to many instances of false recognition. In contrast, participants in a negative mood used a more stringent criterion when making recognition judgments. Thus happiness can lead to greater reliance on general knowledge or stereotypes, and to intrusion errors, in memory.

These effects have been demonstrated in the laboratory using short-term induced moods and experimental stimuli, but little if any research has examined the relation of happiness to reconstructive memory errors in the real world. Much of the research on memory failures has examined memory for neutral stimuli (for a review see Koriat et al., 2000) or for traumatic events that evoked intense negative emotions (e.g., Yuille & Tollestrup, 1992). Though the literature has gained greatly from those investigations, our goal in the current study was to find out if people make reconstructive errors when they recall real world events that made them happy. We hypothesized that, when recalling happy events, people may "paint with broad strokes," drawing on information encoded when events first occurred but also drawing freely on their general knowledge about what is plausible to fill in gaps in their representations. If so, we would expect happy memories to be associated with greater subjective memory clarity, but also with more intrusion errors, than negative memories.

To test this hypothesis, we assessed memory for both true, and plausible but false, details of a real world event that could be verified objectively. To minimize differences between negative and positive events unrelated to emotion, we examined memory for a single event that evoked positive emotion in some people and negative emotion in others.

The Present Investigation

On October 3, 1995, Orenthal James (O. J.) Simpson was acquitted of the murders of his former wife, Nicole Brown Simpson, and her friend, Ron Goldman. The announcement of the verdict was televised live in the United States with all stations airing the same coverage of the courtroom proceedings. The verdict was of intense interest to many Americans because the defendant was a former football hero and because the trial raised thorny issues about equity between races in the American criminal justice system and about spousal abuse. We assessed the emotions and memories of individuals who first found out the verdict by watching the live announcement on television. Participants completed questionnaires one week, two months, and an average of 14 months after the verdict was announced. At each time point, they described how they felt, both when they first learned of the verdict, and when they thought about the verdict now. After two months, participants rated how clearly they recalled events in the courtroom that immediately followed the verdict announcement. After 14 months, participants were given a recognition test in which they indicated whether or not they remembered each event and rated their confidence in their answers.

The objectives of the study were: (a) to examine the relation between the emotional valence of an event and people's *subjective* judgment of the clarity with which they remember the event; (b) to examine the relation between valence and *objective* memory accuracy; (c) to explore whether emotional valence at the time of encoding or retrieval better predicts memory

clarity and accuracy; and (d) to assess whether the association between happiness and reconstructive errors, previously demonstrated in brief laboratory studies using stimuli such as simple narratives and lists of names, generalizes to events and to periods of time that are ecologically relevant to everyday memory and autobiographical memory.

We predicted that feeling happy about the verdict would be associated with greater subjective memory clarity, but more reconstructive memory errors, than feeling negative about the verdict. When asked whether they remember an event, people may subject their recollected experience to careful scrutiny, resulting in conservative judgments. Alternatively, they may draw flexibly on general knowledge about what might have occurred as well as on experience at the time of encoding, resulting in more liberal judgments. Signal detection analyses were conducted to test the prediction that people use a more liberal criterion for judging that they remember events, when the events in question evoked positive as opposed to negative emotion.

Method

Design and Procedure

The study used a quasi-experimental design with repeated measures. Participants completed questionnaires seven days, two months, and more than a year after the announcement of the verdict in the criminal trial of O. J. Simpson. The first questionnaire assessed participants' initial emotional reactions to the verdict announcement, desired verdict, memory performance predictors (prior knowledge, rehearsal), and demographic information. The second and third questionnaires assessed participants' current feelings about the verdict and memory for details of the verdict announcement.

This study was part of a larger project that also examined people's memory for their past emotions (Levine et al., 2001; Levine & Bluck, in press). The current paper presents original

findings concerning memory for emotional events. In this study, only participants who watched the initial televised announcement of the verdict were included.

Participants

Time 1. Seven days after the verdict was announced, questionnaires were completed by 156 undergraduates in a psychology class at the University of California, Irvine. Sixty-nine percent of the participants were female. The ethnicities of the participants approximated the demographics of the campus; they were Asian (42%), Hispanic (28%), Caucasian (24%), African American (2%), and other (4%). Participants ranged in age from 17 to 34 years ($M = 19$, $SD = 1.93$).

Time 2. Two months (56 days) after the verdict was announced, a second questionnaire was completed by 139 of the initial participants. Preliminary analyses revealed no significant differences between students who completed the second questionnaire and students who did not, in terms of demographics, initial emotions, desired verdict, prior knowledge about the verdict, or rehearsal.

Time 3. A third questionnaire was completed by 87 of the initial participants over a year after the verdict was announced ($M = 14$ months, range = 12 to 16 months). No significant differences were found on demographic, emotion, or memory variables when comparing students who completed the third questionnaire and students who did not, with the exception that more females (77%) than males (23%) responded to the third questionnaire.

To avoid anticipatory rehearsal, participants were not informed that they would be questioned again concerning the verdict before receiving the second and third questionnaires. Participants received course credit for completing the first two questionnaires and five dollars for completing the third questionnaire.

Questionnaires

Time 1. The initial questionnaire assessed participants' emotions with the question, "When you first learned of the verdict, how intensely did you feel each emotion listed below?" Participants rated how happy, angry, and sad they felt using 5-point scales ranging from 0 (*not at all*) to 4 (*extremely*). Participants also indicated what verdict they desired (*not guilty, guilty, did not care*). As a measure of prior knowledge about the trial, participants were asked to estimate how much time they had spent each week, in the month before the verdict was announced, watching TV, reading newspapers, or listening to radio accounts concerning the trial. Rehearsal was assessed by asking participants to estimate how much time they had spent, since the verdict was announced, thinking or talking about what went on in the courtroom when the verdict was announced. Prior knowledge and rehearsal were rated on 5-point scales (*none; 1-3 hours; 4-6 hours; 7-9 hours; more than 9 hours*).

Time 2. After two months, participants used 5-point scales to rate how happy, angry, and sad they felt when they thought about the verdict now. Participants also rated the clarity with which they recalled ten events concerning the verdict announcement on a scale ranging from 0 (*not at all clearly*) to 4 (*very clearly*). Half of these events had actually occurred, for example, "O. J. Simpson mouthed the words 'thank you' to the jury," "Johnny Cochran (defense lawyer) pressed his face against Mr. Simpson's shoulder." Half were plausible but had not occurred, for example, "O. J. Simpson gave the 'thumb's up' sign to his lawyer, Robert Shapiro," "Judge Ito told audience members they would have to leave if there were any further disruptions." Both the true and false events were chosen to represent all the major 'players' in the verdict announcement. This was done to avoid the possibility that individuals who focused differentially on either the prosecution or defense side would be advantaged in memory performance.

Time 3. The questionnaire administered after more than a year was identical to the questionnaire administered after two months, with two exceptions. First, memory was assessed for an additional 10 events of the verdict announcement, so that in total, participants rated their memory for 20 events. As in the second questionnaire, half of the events had occurred and half were plausible but had not occurred.¹ Second, memory questions after a year were framed to distinguish between accuracy and confidence. Thus, instead of rating the clarity with which they recalled each event, participants first indicated whether or not they recalled the event (*yes, no*) and then rated how sure they were that they were correct on a scale ranging from 0 (*not at all sure*) to 4 (*very sure*). Final course grades for participants were also obtained.

Results

Initially-Reported Emotions and Desired Verdict

What were participants' initial reactions to Simpson's acquittal? A week after the verdict, 27% of the participants reported that they desired a verdict of not guilty; 49% desired a verdict of guilty; and 24% did not care. Participants' initial emotional reactions to the verdict were expected to vary depending on the verdict they desired. To confirm this, and to check for differences related to gender and ethnicity, we conducted a MANOVA on participants' initial intensity ratings for happiness, anger, and sadness. The between subject variables were desired verdict, gender, and ethnicity. As anticipated, an interaction was found between desired verdict and emotion, $F(4, 296) = 80.46$, $MSE = 0.97$, $p < .0001$. No other significant interactions with emotion were found. Table 1 shows mean initial intensity ratings, and significant contrasts, for happiness, anger, and sadness by desired verdict. These findings simply demonstrate that the verdict announcement was a happy or positive event for participants who desired a verdict of not guilty, a negative event for participants who desired a verdict of guilty, and a relatively neutral

event for participants who did not care. Therefore, we analyzed memory variables by the desired verdict (not guilty, guilty, did not care) to see if the verdict announcement was remembered differently by participants whose reaction to the verdict was positive, negative or neutral.

Before assessing memory, preliminary analyses were conducted to find out whether these three groups differed on variables likely to be related to memory: prior knowledge about the trial, rehearsal, and course grade (a measure of academic performance). These analyses included all participants who completed memory questions after two months ($N = 139$). ANOVAs, with desired verdict as the independent variable, showed no significant differences between groups with respect to rehearsal or course grade. Participants who did not care about the verdict, however, reported having less prior knowledge about the trial ($M = 0.69$, $SD = 0.62$) than either the positive group ($M = 1.09$, $SD = 0.71$) or the negative group ($M = 0.97$, $SD = 0.69$), who did not differ significantly from each other, $F(2, 136) = 3.23$, $MSE = 1.48$, $p = .04$; critical value of $t(136) = 1.98$, $MSE = 0.46$, $p < .05$. Analyses including all participants who completed memory questions after more than a year ($N = 87$) showed the identical pattern of results.

Memory Clarity Ratings After Two Months

Event valence and memory. After two months, participants rated how clearly they recalled 10 events, half true and half false. A MANCOVA (controlling for prior knowledge and rehearsal) was conducted with memory clarity ratings for true events and false events as the dependent variables. The independent variable was whether participants' reaction to the verdict was positive (i.e., desired acquittal), negative (i.e., desired conviction), or neutral (i.e., did not care).² Part A of Table 2 shows the mean memory clarity ratings for true and false events for the three groups. As would be expected, participants recalled events that had occurred ($M = 3.23$, $SD = 1.06$) more clearly than events that had not occurred ($M = 2.45$, $SD = 1.00$), $F(1, 134) = 16.50$,

$MSE = 0.58, p < .0001$. Participants who were happy about the verdict, however, recalled events more clearly ($M = 3.17, SD = 0.85$) than participants whose reaction was negative ($M = 2.79, SD = 0.82$) or neutral ($M = 2.63, SD = 0.95$), irrespective of whether the events had occurred or not, $F(2, 134) = 3.07, MSE = 1.39, p = .05$; critical value of $t(134) = 1.98, MSE = 0.70, p < .05$. No significant difference in memory clarity was found between participants whose reaction to the verdict was negative versus neutral. Rehearsal was also found to be positively associated with memory clarity ratings, $F(1, 134) = 6.65, MSE = 1.39, p = .01$.

Further inspection of the mean clarity ratings for individual events showed that participants whose reaction to the verdict was positive rated the clarity of their memory as higher than participants whose reaction was either negative or neutral for 9 out of the 10 events. Thus, participants who were happy about the verdict recalled events with greater clarity, independent of whether or not the events had occurred.

Emotional intensity and memory. The next analysis was conducted to find out if the intensity of happiness predicted memory clarity, and, if so, whether initially-reported happiness or happiness about the verdict at the time of retrieval better predicted memory clarity. A three-step hierarchical regression analysis was conducted predicting mean memory clarity ratings after two months. On the first step, we entered prior knowledge and rehearsal (5-point scales). On the second step, we entered participants' initial ratings of how happy, angry, and sad they felt about the verdict (5-point scales). On the third step, we entered participants' ratings of how happy, angry, and sad they felt about the verdict at the time of retrieval (5-point scales). The results are shown in Table 3. After controlling for the other variables (i.e., on Step 3 of the analysis), the happier participants felt about the verdict at the time of retrieval, the more clearly they reported remembering events, $t(138) = 3.06, p = .003, \beta = .29$. Note that initially-reported happiness was

significant at Step 2, and also tended to predict memory clarity after other variables were entered into the model (i.e., on Step 3), but this finding did not reach conventional levels of significance, $t(138) = 1.88, p = .063, \beta = .20$.

Recognition Memory After a Year

Event valence and memory. Participants' recognition judgments after more than a year were examined next. A MANCOVA (controlling for prior knowledge and rehearsal) was conducted on the number of true and false events recognized by participants whose emotional reaction to the verdict was positive, negative, or neutral. The results, which are displayed in Part B of Table 2, showed a significant effect of valence, $F(2, 82) = 3.43, MSE = 8.61, p = .04$. Participants who were happy about the verdict recognized more events ($M = 11.73, SD = 3.59$) than did participants whose reaction was negative ($M = 8.74, SD = 4.12$), irrespective of whether the events had occurred or not. Participants whose reaction was neutral did not differ in the number of events recognized from the positive or negative groups ($M = 9.68, SD = 4.64$); critical value of $t(82) = 1.99, MSE = 4.65, p < .05$.³ No other significant differences were found.

An ANCOVA, controlling for prior knowledge and rehearsal, was also conducted on the total number of *correct* recognition responses given. The results showed no significant differences for participants whose emotional reaction to the verdict was positive ($M = 10.65, SD = 2.28$), negative ($M = 11.06, SD = 2.25$), or neutral ($M = 11.36, SD = 2.29$), $F(2, 82) = 0.49, MSE = 2.28, ns$.

Emotional valence and recognition judgment threshold. Participants who were happy about the verdict recognized more events after a year than participants who felt negative. We conducted signal detection analyses to find out if participants who were happy about the verdict were simply less able to discriminate between actual and plausible events (discriminability) or if

they adopted a more liberal criterion for judging events as remembered (bias). We first obtained the hit rate (proportion of true events recognized) and false alarm rate (proportion of false events recognized). Because some participants had hit or false alarm rates of 0 or 1, a standard correction was applied to these rates so that measures of discriminability and bias could be calculated (Snodgrass & Corwin, 1988). Discrimination (D_L) and bias (C_L) indices were then calculated on log transformed data to allow a better approximation to a normal distribution. For the measure of discriminability (D_L), larger values indicate greater ability to discriminate events that occurred from those that did not occur. For the measure of response bias (C_L), a value less than 0 indicates a liberal response bias or tendency to judge events as having occurred; a value greater than 0 indicates a conservative response bias or a tendency to judge events as not having occurred.

Table 4 shows the mean hit and false alarm rates, and measures of discriminability and bias, for participants whose initial emotional reaction to the verdict was positive, negative, or neutral. Single-factor ANOVAs indicated that the groups did not differ significantly on the measure of discriminability (D_L), $F(2, 84) = 0.50$, $MSE = 1.05$, ns , but did differ on the measure of bias (C_L), $F(2, 84) = 3.42$, $MSE = 0.99$, $p = .04$. Post hoc analyses showed that participants who were happy about the verdict used a more liberal criterion for judging that events had occurred (Mean $C_L = -0.35$), whereas participants who reacted negatively used a more conservative criterion (Mean $C_L = 0.34$); critical value of Scheffe's $F(84) = 3.11$, $MSE = 0.98$, $p < .05$. Participants whose reaction to the verdict was neutral did not differ significantly from the positive or negative groups (Mean $C_L = 0.17$).

Emotional intensity and memory. We conducted a hierarchical regression analysis to explore whether the intensity of happiness, anger, or sadness (either initially or at the time of

retrieval) predicted the number of events recognized after a year. The predictors were identical to those entered in the regression analysis conducted on memory clarity after two months. No model significantly predicted event recognition. In summary, greater happiness about the verdict at the time of retrieval predicted greater memory clarity after two months, but did not predict event recognition after more than a year. This may have been because the intensity of participants' current feelings of happiness about the verdict faded considerably between two months and a year (see Levine & Bluck, in press).

Memory Confidence After a Year

Finally, we examined the relation between participants' emotional reactions to the verdict and their confidence in their memory judgments after a year. An ANCOVA was conducted on the mean confidence ratings for all recognition judgments for participants whose emotional reaction to the verdict was positive, negative, or neutral. This analysis controlled for the number of correct recognition judgments as well as for prior knowledge and rehearsal. Memory confidence was greater for correct than for incorrect responses, $F(1, 84) = 6.16$, $MSE = 0.83$, $p = .02$, but did not differ by valence, $F(2, 84) = 2.48$, $MSE = 0.83$, $p = .09$, *ns*. We also conducted a regression analysis to find out if emotional intensity predicted participants' mean confidence in their recognition judgments. The predictors were identical to those in the previous regression analyses except that the number of correct recognition responses was added as the first variable on Step 1. The results showed that greater confidence was predicted by greater accuracy, $t(84) = 2.07$, $p = .04$, $\beta = .22$, and more rehearsal, $t(84) = 2.01$, $p = .05$, $\beta = .22$, but initial and current emotional intensity were not significant predictors of memory confidence.⁴

Discussion

The goal of this study was to investigate the relation between happiness and the

malleability of memory for real world events. We assessed participants' memories for the televised announcement of the verdict in the murder trial of O. J. Simpson, using actual events and plausible foils. After two months, participants whose initial emotional reaction to the verdict announcement was positive recalled events with greater clarity than participants whose initial reaction was negative or neutral. Similarly, after more than a year, participants whose initial reaction was positive recognized more events than participants whose initial reaction was negative. This does not mean that those who felt happy about the verdict were more accurate, however -- they were not. Happy participants recalled events with greater clarity, and recognized more events, independent of whether the events had actually occurred.

The intensity of happiness at the time of retrieval also played a role in how clearly participants reported remembering the verdict announcement. The happier participants felt about the verdict after two months, the more clearly they reported remembering events. Signal detection analyses, conducted on participants' recognition judgments after more than a year, showed that participants who were happy about the verdict used a more lenient threshold for judging that events had occurred than participants whose reaction to the verdict was negative. Participants who reacted negatively were more likely to err in a conservative fashion by rejecting events. Thus fewer errors of omission, and more errors of commission, were made when recalling positive events than when recalling negative events.

These findings are consistent with a growing body of laboratory research showing that people use different information processing strategies when they are in a positive versus a negative mood. When making social judgments, happiness leads to greater reliance on general knowledge or schemas whereas a negative mood leads to conservative judgments that adhere more closely to the information presented (for reviews see Bless & Schwarz, 1999; Forgas,

2002). The differing information processing strategies associated with positive and negative emotion have also been shown to affect memory. Inducing happiness leads to schema-consistent intrusion errors when remembering narratives (Bless et al., 1996) and to stereotype-consistent intrusion errors when recognizing ethnic names (Park & Banaji, 2000). Closer to real world events, in two eyewitness memory studies participants watched conflict scenarios. Later, they received a mood induction and were then exposed to misleading information. After intervals of an hour or a week, positive mood increased memory intrusion errors (unpublished studies cited in Forgas, 2002, p. 11).

The current study extends these findings to memory for real world events that evoked happiness and to retention intervals of over a year. Memories become sketchy over time. Our findings suggest that people draw freely on general knowledge to reconstruct memories of happy events. Incorporating plausible or schema-congruent information from general knowledge when remembering events that evoked happiness would result in representations that are *experienced* as more complete. This may explain why people rate positive events as better remembered than negative events (e.g., Thompson et al., 1996), even though studies with objective measures often show no differences or even superior memory for negative events (e.g., Banaji & Hardin, 1994; Bluck & Li, 2000).

Memory for both negative and positive events become sketchy with time, however. Why would people report remembering more true and false aspects of an event that made them happy? Events that evoked negative emotions are goal-discrepant and indicate a problem to be resolved (Bluck & Alea, 2003; Levine & Safer, 2002). When remembering such events, people may engage in critical evaluation in the service of repairing past negative outcomes or avoiding future ones. In contrast, events that made people happy are consistent with their goals. Drawing

flexibly on general knowledge when remembering such events may allow people to build on previous goal achievement without the risk that being slightly mistaken will lead to danger or difficulty (e.g., Fredrickson, 2001). Thus, when remembering happy occasions, people may "paint with broad strokes," remembering much of what happened but blurring the lines between actual and merely plausible events.

Examining "errors" in memory for real world emotional events encourages us to reevaluate what constitutes an error, and an error at what price (Bluck, 2003). The tendency to make errors can be weighed against the possible gain incurred from integrative information-processing. "Painting with broad strokes" may be appropriate when remembering happy events. The same liberal tendency may be less prudent when negative events are recalled and lack of attention to details can lead to becoming embroiled in a new negative situation. As such, emotion may be an arbiter of how much risk of error is permissible in the pursuit of flexible and creative thinking.

Alternative Explanations and Limitations

An alternative explanation is that this is not a memory effect at all. Participants remembering events that made them happy may simply endorse positive (or higher) values on rating scales, including memory scales. If this were the case, though, happiness would have been associated with higher memory confidence ratings too, and it was not. Memory confidence, which is influenced by a variety of factors in addition to the subjective clarity or vividness of memory (Zakay, 1998), was not related to either emotional valence or intensity.

Another explanation is that participants might have used their emotions to inform memory judgments. When asked whether they remembered an event, participants may have asked themselves, "How do I feel about it," and feelings of happiness may have been taken as

indications of familiarity (Schwarz & Clore, 1983). The methods we used make this explanation unlikely, however. Research shows that when people's attention is drawn to the true cause of their mood, they typically discount mood, and it does not influence judgments (Gasper & Clore, 2000). In the current study, questions about participants' reactions to the verdict came before memory questions, making the source of their emotions explicit. Thus, the association between happiness and memory for both true and false information is most consistent with the view that happiness, at encoding and retrieval, promotes an information-processing style that allows the incorporation of reasonable but incorrect information from general knowledge.

Limitations of the study also should be noted. Because a quasi-experimental design was used, we cannot rule out the possibility that happy participants differed on some unmeasured factor from participants who had a negative reaction. Our confidence in the association found between happiness and memory malleability is increased by the fact that similar findings have been obtained in laboratory studies employing random assignment to positive and negative emotion-induction conditions (Bless et al., 1996; Park & Banaji, 2000). Also, although the verdict elicited intense emotion, future research is needed to confirm that the association between happiness and memory malleability extends to events with more personal consequences.

Conclusion

A pressing question in emotion and memory research is whether results obtained in brief laboratory studies generalize to real world emotional experiences (Yuille & Tollestrup, 1992). This study demonstrates that the association between happiness and reconstructive memory extends to memory for real world events over retention intervals of more than a year. It supports a functional view of specific emotions: happiness promotes flexible and constructive information processing not only in reasoning and judgment but in memory over time.

References

- Banaji, M. R. & Hardin, C. (1994). Affect and memory in retrospective reports. In N. Schwarz & S. Sudman (Eds.), *Autobiographical memory and the validity of retrospective reports* (pp. 71-86). New York: Springer-Verlag.
- Bless, H., Bohner, G., Schwarz, N., & Strack, F. (1990). Mood and persuasion: A cognitive response analysis. *Personality and Social Psychology Bulletin*, *16*, 331-345.
- Bless, H., Clore, G. L., Schwarz, N., Golisano, V., Rabe, C., & Wolk, M. (1996). Mood and the use of scripts: Does a happy mood really lead to mindlessness? *Journal of Personality and Social Psychology*, *71*, 665-679.
- Bless, H., & Schwarz, N. (1999). Sufficient and necessary conditions in dual process models: The case of mood and information processing. In S. Chaiken & Y. Trope (Eds.), *Dual process theories in social psychology* (pp. 423-440). New York: Guilford Press.
- Bluck, S. (2003). Autobiographical memory: Exploring its functions in everyday life. *Memory*, *11*, 113-123.
- Bluck, S., & Alea, N. (2003). Exploring the functions of autobiographical memory: Why do I remember the autumn? In J. D. Webster and B. K. Haight (Eds). *Critical advances in reminiscence: from theory to application* (pp. 61 - 75). New York: Springer.
- Bluck, S., & Li, K. Z. H. (2001). Predicting memory completeness and accuracy: Emotion and exposure in repeated autobiographical recall. *Applied Cognitive Psychology*, *15*, 145-158.
- Bodenhausen, G. V., Kramer, G. P., & Susser, K. (1994). Happiness and stereotypic thinking in social judgment. *Journal of Personality & Social Psychology*, *66*, 621-632.
- Fiedler, K., Asbeck, J., & Nickel, S. (1991) Mood and reconstructive memory effects on social judgment, *Cognition & Emotion*, *5*, 363-378.

- Forgas, J. P. (2002). Feeling and doing: Affective influences on interpersonal behavior. *Psychological Inquiry, 13*, 1-28.
- Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist, 56*, 218-226.
- Gasper, K., & Clore, G. L. (2000). Do you have to pay attention to your feelings to be influenced by them? *Personality & Social Psychology Bulletin, 26*, 698-711.
- Holmes, D. S. (1970). Differential change in affective intensity and the forgetting of unpleasant experiences. *Journal of Personality and Social Psychology, 3*, 234-239.
- Isen, A. M., Daubman, K. A., & Nowicki, G. P. (1987). Positive affect facilitates creative problem solving. *Journal of Personality and Social Psychology, 52*, 1122-1131.
- Koriat, A., Goldsmith, M., & Pansky, A. (2000). Toward a psychology of memory accuracy. *Annual Review of Psychology, 51*, 481-537.
- Kreitler, H., & Kreitler, S. (1968). Unhappy memories of "the happy past": Studies in cognitive dissonance. *British Journal of Psychology, 59*, 157-166.
- Levine, L. J., & Bluck, S. (in press). How emotions fade: Valence, appraisals and the emotional impact of remembered events. *Advances in Psychological Research*. Hauppauge, New York: Nova Science.
- Levine, L. J., Prohaska, V., Burgess, S. L., Rice, J. A., & Laulhere, T. M. (2001). Remembering past emotions: The role of current appraisals. *Cognition and Emotion, 15*, 393-417.
- Levine, L. J., & Safer, M. A. (2002). Sources of bias in memory for emotions. *Current Directions in Psychological Science, 11*, 169-173.
- Mackie, D., & Worth, L. T. (1989). Processing deficits and the mediation of positive affect in persuasion. *Journal of Personality and Social Psychology, 57*, 27-40.

- Master, D., Lishman, W. A., & Smith, A. (1983). Speed of recall in relation to affective tone and intensity of experience. *Psychological Medicine, 13*, 325-331.
- Matlin, M. W., & Stang, D. J. (1978). *The Pollyanna principle: Selectivity in language, memory, and thought*. Cambridge, MA: Schenkman Publishing Company.
- Park, J., & Banaji, M. R. (2000). Mood and heuristics: The influence of happy and sad states on sensitivity and bias in stereotyping. *Journal of Personality and Social Psychology, 78*, 1005-1023.
- Schwarz, N., & Clore, G. L. (1983). Mood, misattribution, and judgment of well-being: Informative and directive functions of affective states. *Journal of Personality and Social Psychology, 45*, 513-523.
- Snodgrass, J. G., & Corwin, J. (1988). Pragmatics of measuring recognition memory. *Journal of Experimental Psychology: General, 117*, 34-50.
- Thompson, C. P., Skowronski, J. J., Larsen, S. F., Betz, A. (1996). *Autobiographical memory: Remembering what and remembering when*. Mahwah, NJ: Erlbaum.
- Walker, W. R., Skowronski, J. J., & Thompson, C. P. (2003). Life is pleasant—and memory helps to keep it that way! *Review of General Psychology, 7*, 203-210.
- Walker, W.R., Vogl, R.J., & Thompson, C.P. (1997). Autobiographical memory: Unpleasantness fades faster than pleasantness over time. *Applied Cognitive Psychology, 11*, 399-413.
- Yuille, J. C., & Tollestrup, P. A. (1992). A model of the diverse effects of emotion on eyewitness memory. In S. -A. Christianson (Ed.), *The Handbook of Emotion and Memory* (pp. 201-215). Hillsdale, NJ: Erlbaum.
- Zakay, D. (1998). Determinants of confidence in accuracy of knowledge retrieval. *European Journal of Cognitive Psychology, 10*, 291-306.

Author Note

Linda J. Levine, Department of Psychology and Social Behavior, University of California, Irvine; Susan Bluck, Center for Gerontological Studies, Department of Psychology, University of Florida.

We thank Susan Charles, Heather Lench, and Martin Safer for comments on previous drafts.

Correspondence concerning this article should be addressed to Linda J. Levine, Department of Psychology and Social Behavior, University of California, Irvine, 3340 Social Ecology II, Irvine, California 92697-7085. Email: llevine@uci.edu.

Footnotes

¹To find out if false events were as plausible as true events, we presented the 10 true and 10 false events to two (previously un-tested) groups of undergraduates 14 months after the verdict had been announced. One group had viewed the verdict announcement on TV ($n = 47$); the other group had not ($n = 53$). Participants were asked to indicate whether or not they thought each event had occurred. If false events were not as plausible as true events, then the “No TV” group should have endorsed more true than false items. No significant difference was found, however, in the number of true ($M = 4.77$) and false events ($M = 4.94$) endorsed by the No TV group, $t = -0.51$, *ns*. In contrast, the group that had viewed the events on TV endorsed more true events ($M = 5.14$) than false events ($M = 4.32$), $t = 2.97$, $p = .01$.

²The analyses of memory reported in this paper also were conducted including ethnicity and gender. Including these variables did not alter the significance of the emotional valence effects in any analysis.

³As Table 2 shows, the neutral group fell slightly below the negative group on memory clarity ratings, but fell between the positive and negative groups on the number of events recognized. Subjective assessments such as event importance, which may contribute to memory clarity judgments, tend to be positively correlated with emotional intensity (Thompson et al., 1996). Thus, people who feel neutral about events typically rate memory clarity as relatively low. Recognition judgments are better for teasing apart whether an event is remembered from other assessments such as importance. The key finding, however, was that the positive and negative groups differed significantly on both memory measures. The familiarity of events, tapped by both memory measures, was greater for participants whose reaction to the verdict was positive.

⁴The regression analyses reported in this paper were conducted on mean values for all events (i.e., mean memory clarity ratings, mean number of events recognized, mean confidence). We also conducted multivariate regression analyses with true and false events as the dependent variables. The results of these analyses also showed that greater intensity of happiness at the time of retrieval predicted greater memory clarity ratings after two months, and that emotional intensity did not predict recognition or confidence judgments after more than a year.

Table 1

Mean Initial Intensity Ratings for Happiness, Anger, and Sadness by Desired Verdict

Desired verdict	<i>n</i>	Happiness	Anger	Sadness
1. Not guilty	41	2.71 (1.19)	0.37 (0.80)	0.56 (0.71)
2. Guilty	76	0.26 (0.74)	2.64 (1.27)	2.46 (1.19)
3. Did not care	39	1.13 (1.08)	0.56 (0.64)	0.74 (0.99)
Contrasts		1 > 2 & 3; 3 > 2	2 > 1 & 3	2 > 1 & 3

Note. Values in parentheses represent standard deviations. Post hoc comparisons shown in the "Contrasts" row were conducted using Scheffe's *F* with a critical value of 3.06, $p < .05$, $MSE = 0.80$ for happiness, 1.07 for anger, and 1.09 for sadness.

Table 2

Memory for True and False Events for Participants Whose Reaction to the Verdict was Positive, Negative, or Neutral

Reaction to verdict	<i>n</i>	True events		False events	
		<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)
A. Mean Memory Clarity Ratings After 2 Months					
Positive	34	3.44	(0.18)	2.85	(0.16)
Negative	69	3.18	(0.12)	2.37	(0.11)
Neutral	36	3.13	(0.18)	2.23	(0.16)
B. Mean Number of Events Recognized After 14 Months					
Positive	20	6.19	(0.50)	5.54	(0.59)
Negative	48	4.89	(0.31)	3.84	(0.37)
Neutral	19	5.54	(0.51)	4.14	(0.60)

Table 3

Summary of Hierarchical Regression Analysis for Variables Predicting Mean Memory Clarity Ratings After Two Months (N = 139)

	Variable	<i>B</i>	<i>SE B</i>	β
Step 1	Prior knowledge	.22	.10	.17*
	Rehearsal	.21	.08	.20*
Step 2	Prior knowledge	.17	.10	.13
	Rehearsal	.17	.08	.17*
	Initial happiness	.22	.06	.35***
	Initial anger	.07	.07	.13
	Initial sadness	.08	.07	.12
Step 3	Prior knowledge	.11	.10	.09
	Rehearsal	.15	.08	.15
	Initial happiness	.13	.07	.20
	Initial anger	.03	.08	.04
	Initial sadness	.07	.07	.11
	Current happiness	.26	.09	.29**
	Current anger	.10	.10	.15
	Current sadness	-.01	.08	-.02

Note. $R^2 = .09$ for Step 1; $\Delta R^2 = .08$ for Step 2; $\Delta R^2 = .05$ for Step 3 ($ps < .05$).

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4

Mean Hit and False Alarm Rates, and Measures of Discriminability and Bias, for Participants Whose Initial Emotional Reaction to the Verdict was Positive, Negative, or Neutral (N = 87)

Emotional reaction	<i>n</i>	Hit rate <i>H</i>	False alarms <i>FA</i>	Discriminability <i>D_L</i>	Bias <i>C_L</i>
Positive	20	.60	.55	.25	-.35
Negative	48	.49	.40	.51	.34
Neutral	19	.55	.42	.52	.17