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Autobiographical Memory: Unpleasantness Fades Faster Than Pleasantness Over Time

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SUMMARY

We examined the effects of retention intervals on the recollection of the emotional content of events. Memory for personal events was tested for three retention intervals: 3 months, 1 year, and 4.5 years. Participants made pleasantness ratings both at the time of recording the event and during testing of the events. Analyses of the data show that judgments of pleasantness or unpleasantness of an event became less extreme as retention interval increased. This effect was larger for unpleasant events than for pleasant events. Subsequent memory ratings of pleasant and unpleasant events showed a modest effect of pleasantness with pleasant events remembered slightly better than unpleasant events. The theoretical implications of these data are discussed. © 1997 John Wiley & Sons, Ltd.

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Our experience tells us that emotions fade over time. Most adults have had at least one extremely unpleasant experience, such as the death of a loved one or the failure of an important personal relationship. The emotion produced by such events is intense, painful, and long lasting. However, as months and years pass by, the unpleasantness associated with the event memory gradually loses intensity. Of course, the phenomenon of fading occurs for pleasant events as well. The focus of this study is on how the pleasantness compared to the unpleasantness associated with autobiographical memories fade over time.

There has been much research on the effects of pleasantness on memory. Many empirical studies have focused on the relationship between the affective component of the event and the ability to recall the event (e.g., see Banaji and Hardin, 1994; Holmes, 1990). One overall trend in the research is that pleasant events are recalled slightly better than unpleasant events (Bower and Gilligan, 1979; Brewer, 1988;

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Holmes, 1970; Linton, 1975; Matlin and Stang, 1978; Robinson, 1980; Thompson, Skowronski, Larsen and Betz, 1996; Wagenaar, 1986). However, there have been several exceptions to the general rule (Banaji, 1986; Kreitler and Kreitler, 1968; Skowronski and Carlston, 1987). Several researchers have suggested that these contradictory results are due to the relationship between the emotional intensity at the time the event was encoded and the emotional intensity at the time the event was retrieved (e.g., Bower, Monteiro and Gilligan, 1978; Holmes, 1970). Their argument is based on the differential fading of emotions first described by Cason (1932).

In a retrospective task, Cason (1932) asked participants to describe personal events and indicate how they felt about each event both at the time of the event and at the time they described it. Participants described from three to eight emotional memories from the previous week. Participants were asked to rate how they felt about each memory on an 11-point scale. Participants made similar judgments 3 weeks after recording the events. Cason found that the feelings associated with events became weaker with the passage of time. This tendency was stronger for events that were unpleasant than for events that were pleasant. Given that these findings were obtained using a retrospective task, it is unclear whether these data represent emotions fading over time or a selective bias at recollection.

Based on the findings of Cason, Holmes (1970) suggested that negative affect would drop more than positive affect over time. He also hypothesized that more emotionally intense events were more likely to be recalled than less emotionally intense events. According to Holmes (1970), the interaction of these two factors could explain the effect of pleasantness on memory. It follows that, if recall is influenced by the intensity of affect at the time of recall, it would be expected that initially pleasant events would be more likely to be recalled than initially unpleasant events after a period of time. To test his predictions, Holmes had participants record pleasant and unpleasant events for a week and tested their recall and current affect for the events after a 1-week retention interval. Holmes's (1970) data showed that unpleasant events faded in emotional intensity more quickly than pleasant events. However, although participants recalled more events that were initially pleasant than events that were initially unpleasant, the difference was not statistically reliable.

Holmes (1970) offered several possible explanations for why unpleasant events decreased in affective intensity more rapidly than pleasant events. He suggested that, after a period of time, the event did not produce the negative consequences that were anticipated. Also, a person could take action to remedy the situation thus changing the feeling associated with the event. Holmes stated that 'during the retention interval something occurred or was done so that the tension or intensity was reduced' (p. 238).

While the data collected by Cason (1932) and Holmes (1970) are intriguing and seem intuitively correct, there are problems with both studies. The retention intervals in both studies are quite short for autobiographical memory research: 1 week in Holmes's study and 3 weeks in Cason's study. Holmes used a test after a single retention interval that leaves open the possibility, assuming the emotional scale goes from negative (unpleasant emotions) to positive (pleasant emotions), that the observed fading of emotions could simply represent regression toward the mean. Finally, the Cason study was a retrospective study and the possibility of substantial memory errors in retrospective reports is now well-established (e.g., Neisser and Harsch, 1992).

The present study was conducted to replicate and extend the findings from both the Cason (1932) and Holmes (1970) studies. Several retention intervals were used to

determine whether changes in emotional intensity could be attributed to regression towards the mean. Alternatively, we suggest that if the emotion connected to memories fades over time, the emotional intensity should drop systematically as retention interval increases. Similarly, if there is differential fading of pleasant and unpleasant emotions, that difference should increase with increasing retention intervals.

There are a host of theories that address the issue of the effects of retention intervals on the recollection of pleasant and unpleasant memories (for reviews, see Matlin and Stang, 1978; Taylor, 1991). Whatever the outcome of the present study, our data are relevant for these theories. In the discussion, we examine the implications of our data for the psychoanalytic concept of repression (Freud, 1900/1965) and Taylor's (1991) mobilization-minimization hypothesis. Both theories make speculations about how people cope with pleasant and unpleasant memories.

The present paper draws upon data from three diary experiments. In each experiment, participants kept diaries of personal events from their life with one event recorded each day. The participants rated the pleasantness of each event when it was recorded. Later, the participants were asked to rate how well they remembered the event and to rate the pleasantness of the event at the time of test. The three experiments differed in the duration of the diaries and the maximum retention interval before the test.

EXPERIMENT 1: 3-MONTH RETENTION INTERVAL

This experiment was conducted as a conceptual replication of Holmes's (1970) study. We extended the maximum retention interval to 3 months. (We use the term '3 months' to facilitate reading. Because participants recorded events every day up to the time of test, the retention interval for each participant varied from 1 day to about 95 days.) Following Holmes (1970), we hypothesized that the emotional intensity of unpleasant events would fade faster than the emotional intensity of pleasant events. We also hypothesized that initially pleasant events would be recalled better than initially unpleasant events. Finally, we hypothesized that the emotional state at the time of test was more important for predicting recall than the emotional state at the time of the event.

Method

Participants

The participants were 43 undergraduates enrolled in an introductory psychology class at Kansas State University. All received class credit for participation.

Materials

The materials were diaries recorded by the participants during a 3-month period. The participants recorded one unique, personal event each day, and the event records were collected once each week. The participants were instructed that the events had to meet the following restrictions: (1) the events had to be unique (i.e., they were expected to occur only once during the semester); (2) they could not be embarrassing; (3) they were to be described in three written lines or less.

Procedure

Each of the participants recorded events for approximately 14 weeks. During the 15th week the participants were individually tested over the content of their diaries.

Prerating

At the time the event was recorded, the participants rated several aspects of the event. Only the pleasantness rating will be considered in this paper. Participants rated the pleasantness of the event using a 7-point scale ranging from *very pleasant* (+3) to *very unpleasant* (-3), with a rating of 0 indicating neutral.

Testing

While testing, the events were read to the participants using a random order of presentation. In responding to each event, the participants provided several pieces of information for each event. Only the memory ratings and pleasantness ratings will be considered here.

The participants first determined whether the event was unique. This procedure was used because it would not be possible for a participant to provide specific information for events that occurred more than once during the semester. If an event was not unique, it was deleted, and the participant went on to the next event.

If the event was judged to be unique, the participants rated how well they remembered the event on a 7-point scale. This scale was first used by Herrmann and Neisser (1978) and is as follows: *not at all* (1); *barely at all* (2), *not so well* (3), *fairly well* (4), *very well* (5), *almost perfectly* (6), and *perfectly* (7). The participants were informed that a rating of 7 was very unusual. This meant that if the event included a conversation, they could essentially recall the conversation word-for-word. If the event was not remembered at all, the participants went on to the next event.

Following the memory rating, the participants provided a pleasantness rating for the event at the time of test (i.e., how did the participants currently feel about the event?). The participants used the same 7-point scale that they had used at the time the event was recorded.

Results

Distinction between pleasantness and intensity

The pleasantness rating made by participants contained two components: pleasantness and intensity. The two components for each event were separated by using the '+/-' in the rating to code pleasantness and the numeric rating ('1, 2, 3') to code intensity. Event pleasantness referred to whether the event was initially pleasant or unpleasant. Emotional intensity referred to the extremity of the initial pleasantness rating independent of the event's pleasantness (i.e., the absolute value). For example, an event rated as '+2' would be coded as a pleasant event with an intensity rating of 2. Other research suggests that the emotional content of an event can be parsed into these two components (e.g., Thomas and Diener, 1990).

Events as the unit of analysis

Each participant's diary consisted of about 95 events, which varied along multiple dimensions including pleasantness and intensity. The changes in emotional intensity in which we were interested occurred at the level of individual events. For that

reason, our analyses were conducted on pleasant and/or unpleasant events collapsed across participants. This approach is apparent in the degrees of freedom terms that represent the number of events entered into the analysis.

Regression procedure

Two regression procedures were used as part of the data analyses. A hierarchical regression analysis was used to investigate the effects of retention interval on pleasantness ratings. A regression analysis was deemed suitable since retention interval (or event age) is a continuous variable. The dependent measure in these analyses was the mean difference in intensity between initial and final pleasantness ratings. There were three relevant predictors in this equation: event age, event pleasantness, and the interaction between event age and event pleasantness. Event age referred to the difference in days between the event date and the date of test. A similar regression equation was used to investigate the effects of intensity and pleasantness on final memory ratings. The quadratic effect of event age was also included as a predictor but will not be discussed here (see Thompson *et al.*, 1996).

A stepwise regression procedure was used to investigate the effects of initial and final ratings on final memory ratings. A stepwise regression analysis was deemed useful because the important theoretical predictors of overall memory had been identified (event age, quadratic event age, initial emotional intensity, final emotional intensity, initial pleasantness, and final pleasantness) but these predictors could not be arranged in terms of theoretical importance.

Change in pleasantness

Paired *t*-tests were used to compare the initial and final pleasantness ratings for both pleasant and unpleasant events. Events that were initially rated as neutral (i.e., a rating of 0) were not included in these analyses. Neutral events accounted for approximately 4% of the data. The initially neutral events were excluded on the basis that no systematic change was noted for initially neutral events at the time of test. When the initial and final pleasantness ratings were compared, the analyses showed that final ratings were less extreme for both pleasant, $t(1567) = 2.30, P < 0.05$, and unpleasant events, $t(682) = 5.28, P < 0.01$. A significant effect of pleasantness was noted such that the change in pleasantness ratings was larger for unpleasant events than for pleasant events, $t(2249) = 29.44, P < 0.001$. The first row of Table 1 presents the mean pleasantness ratings for pleasant and unpleasant events at both the time of recording the event (initial) and at the time of test (final) for this experiment.

We also compared the magnitude of the change in pleasantness ratings for unpleasant events to that for pleasant events. The change was larger for unpleasant events than for pleasant events, $t(2249) = 22.44, P < 0.001$.

We also used a regression analysis to examine the differential fading of pleasant and unpleasant emotions across increasing retention intervals. For this analysis, the absolute difference between initial and final pleasantness ratings was calculated for each event. These data were entered into a hierarchical regression analysis with three relevant predictors: event age, event pleasantness, and the interaction between event age and event pleasantness. A significant Event Age \times Event Pleasantness interaction was noted such that the unpleasantness associated with events faded more rapidly than the pleasantness associated with events, $F(1, 2118) = 89.95, MSE = 1.18, P < 0.001$.

Table 1. Mean initial and final pleasantness ratings and mean change between initial and final pleasantness ratings presented separately for 3-month (Experiment 1), 1-year (Experiment 2), and 4.5-year (Experiment 3) retention intervals

Retention interval	Event affect					
	Pleasant			Unpleasant		
	Initial rating	Final rating	Absolute change	Initial rating	Final rating	Absolute change
3 months	2.17	2.12	0.05	-1.48	-1.32	0.16
1 year	1.39	0.93	0.46	-1.48	-0.68	0.80
4.5 years	1.59	0.47	1.12	-1.62	-0.16	1.46

The retention intervals stated are maximum intervals. See the text for a full description.

Effects of emotional intensity and pleasantness on memory ratings

To investigate the effects of initial emotional intensity and event pleasantness on subsequent memory ratings, the data were entered into a hierarchical regression equation with four relevant predictors: linear event age, quadratic event age, initial emotional intensity, and initial event pleasantness. Events that were initially rated as neutral were not included in this analysis (4% of the data). The effects of linear event age and quadratic event age have been investigated elsewhere and will not be focused on here (see [Thompson et al., 1996](#)). An effect of emotional intensity was noted such that events of greater intensity were remembered better than events of lesser intensity, $F(1,2118) = 23.11$, $P < 0.001$, $MSE = 2.77$. Pleasant events ($M = 4.43$) were remembered significantly better than unpleasant events ($M = 4.38$), $F(1,2118) = 4.05$, $P < 0.05$, $MSE = 2.77$. The first row of Table 2 presents the mean final memory rating for pleasant and unpleasant events by their intensity for the 3-month retention interval.

Initial versus final ratings in predicting memory ratings

According to [Holmes \(1970\)](#), the emotional state of the person at the time of recalling the event should influence the recall of the event more than the state of the person at the time of the event. We reasoned that these states could be estimated by

Table 2. Mean final memory ratings for each intensity rating (i.e., the absolute value of the pleasantness rating) presented separately for pleasant and unpleasant events and separately for 3-month (Experiment 1), 1-year (Experiment 2), and 4.5-year (Experiment 3) retention intervals

Retention interval	Event affect					
	Pleasant intensity rating			Unpleasant intensity rating		
	1	2	3	1	2	3
3 months	4.11	4.30	4.89	4.17	4.33	4.65
1 year	3.89	4.19	4.80	3.91	4.23	4.67
4.5 years	2.62	3.30	3.30	2.58	2.60	3.57

The retention intervals stated are maximum intervals. See the text for a full description.

using initial pleasantness ratings and final pleasantness ratings. If Holmes is correct, then final pleasantness ratings should be better predictors of the overall memory ratings than initial pleasantness ratings.

We used a stepwise regression format with six relevant predictors: linear event age, quadratic event age, initial emotional intensity, final emotional intensity, initial pleasantness, and final pleasantness. Final intensity was the best predictor of final memory ratings, $F(1, 2118) = 119.78, P < 0.0001, MSE = 3.94$. Initial pleasantness was the next best predictor of final memory ratings, $F(1, 2118) = 13.06, P < 0.001, MSE = 3.94$. Final pleasantness was the third and final predictor of final memory ratings, $F(1, 2118) = 4.10, P < 0.05, MSE = 3.94$. In general, final ratings were slightly better predictors of final memory ratings than initial ratings.

Discussion

The data supported our hypotheses concerning the effects of retention interval on memory for pleasant and unpleasant events. First, both pleasant and unpleasant affects fade with time. However, the emotional intensity for unpleasant events fades faster over time than does the emotional intensity for pleasant events. Second, emotional intensity at time of test was the best predictor of an event's memorability. Third, events that are pleasant are slightly more memorable than events that are unpleasant.

EXPERIMENT 2: 1-YEAR RETENTION INTERVAL

Experiment 2 extended the maximum retention interval to 1 year. Note that the diaries collected for this study varied from 1.5 to 2.5 years in duration. To make the retention interval consistent across participants, we examined the most recent year in this experiment. Once again, we expected that the emotional intensity of unpleasant events should continue to fade faster than the emotional intensity of pleasant events. Second, the pleasantness rating given at time of test should be more important for predicting recall than the pleasantness rating given at the time of the event. Third, initially pleasant events should be recalled better than initially unpleasant events.

Method

Participants

The participants were six undergraduates enrolled at Kansas State University. The participants served as a control group in a 3-year study of an individual with exceptional memory skill. As a part of the 3-year study the participants were asked to keep diaries. The participants received monetary compensation for participation.

Materials

The materials were diaries recorded by the participants. The participants recorded one event each day, and the event records were collected once each week. Also, the events had to meet the same restrictions as the events in the previous study. These diaries differed from the diaries in Experiment 1 in duration. The duration of the diaries ranged from 1.5 to 2.5 years, but the portion of the diaries used for this

experiment consisted of unique personal events that occurred during the 1-year period prior to test.

Procedure

The procedure for this experiment was similar to the procedure for the previous study. The studies differ in the duration of the diaries and the retention interval for the events. In the present experiment, the participants kept diaries for periods ranging from 1.5 to 2.5 years. During the weeks after the last diaries had been collected, the participants were individually tested over the content of their diaries.

Prerating

The ratings at the time the event was recorded were the same as the ratings made in the previous study. Only the participant's rating of the pleasantness of the event will be considered in this paper. Participants rated the pleasantness of the event using a 7-point scale ranging from +3 for *very pleasant* to -3 *very unpleasant* (0 indicated neutral).

Testing

The events were read to the participants using a random order of presentation. In responding to each event, the participants determined whether the event was unique and provided memory ratings and pleasantness ratings for each event using the same scales that were given in the previous experiment.

Results

As noted in the procedure, the maximum retention intervals in these diaries ranged from 1.5 to 2.5 years. To make our results generalizable across all six participants, we used only events from the most recent year.

Change in pleasantness

Paired *t*-tests were used to assess the difference between initial and final pleasantness ratings. Again, events that were initially rated as neutral were not included in these analyses (approximately 11% of the data). Pleasantness ratings for both pleasant and unpleasant events became less extreme when the initial and final ratings were compared, $t(1001) = 12.69$, $P < 0.01$ for pleasant events; $t(261) = 16.78$, $P < 0.01$ for unpleasant events. A larger change in pleasantness ratings was noted for unpleasant events than for pleasant events, $t(1262) = 10.52$, $P < 0.01$. The second row of Table 1 presents the mean intensity ratings for pleasant and unpleasant events at both the time of recording the event and at the time of test for this experiment.

Once again, we also used a regression analysis to examine the differential fading of pleasant and unpleasant emotions across increasing retention intervals. The absolute difference between initial and final pleasantness ratings was calculated for each event. These data were entered into a hierarchical regression analysis with three relevant predictors: event age, event pleasantness, and the interaction between event age and event pleasantness. As before, an Event Age \times Event Pleasantness interaction showed that the unpleasantness associated with events faded more rapidly than the pleasantness associated with events, $F(1, 1208) = 7.32$, $MSE = 1.18$, $P < 0.01$.

Effects of emotional intensity and pleasantness on final memory ratings

As in Experiment 1, a hierarchical regression analysis using linear event age, quadratic event age, initial emotional intensity, and initial event pleasantness as relevant predictors was used to examine the effects of initial emotional intensity and initial event pleasantness on final memory ratings. Events that were initially rated as neutral were not included in this analysis (approximately 11% of the data). An effect of emotional intensity was noted such that events of greater emotional intensity were remembered better than events of lesser intensity, $F(1, 1208) = 18.53, P < 0.01, MSE = 0.89$. Pleasant events ($M = 4.32$) were again remembered significantly better than unpleasant events ($M = 4.25$), $F(1, 1208) = 4.08, P < 0.05, MSE = 0.89$. The second row of Table 2 presents the mean final memory rating for pleasant and unpleasant events by their intensity for the 1-year retention interval.

Initial versus final ratings in predicting memory ratings

A stepwise regression analysis similar to the one used in Experiment 1 was used. Six relevant predictors were included: linear event age, quadratic event age, initial emotional intensity, final emotional intensity, initial pleasantness, and final pleasantness. Final emotional intensity was the best predictor of final memory ratings, $F(1, 1208) = 333.39, P < 0.001, MSE = 0.99$. Initial pleasantness was the next best predictor of final memory ratings, $F(1, 1208) = 5.81, P < 0.05, MSE = 0.99$. Again, the final emotional intensity rating was a much better predictor of event memory than both initial emotional intensity and initial pleasantness ratings.

Discussion

The data supported our hypotheses concerning the effects of retention interval on memory for pleasant and unpleasant events. First, both pleasant and unpleasant affects fade with time. The emotional intensity for unpleasant events fades more over time than does the emotional intensity for pleasant events. Second, the emotional intensity at the time of test was the best predictor of an event's memorability. Third, events that are pleasant are rated slightly more memorable than events that are unpleasant.

EXPERIMENT 3: 4.5-YEAR RETENTION INTERVAL

Experiment 3 extended the maximum retention interval to 4.5 years. As in the other two experiments, we expected the emotional intensity of unpleasant events to fade faster than the emotional intensity of pleasant events. Second, the pleasantness rating given at the time of test should be more important for predicting recall than the pleasantness rating given at the time of the event. Third, initially pleasant events should be recalled better than initially unpleasant events.

To demonstrate that the emotion connected to an event continues to fall over increasing retention intervals, we added an analysis combining the data from all three experiments. That analysis compared the drop in emotional intensity over the three retention intervals.

Method

Participant

The participant was one graduate student enrolled at Kansas State University. The participant kept a diary for 9 months along with the six long-term diary participants in the previous study. Due to a misunderstanding, he was not tested with the other participants. This oversight was not discovered for 4.5 years. The participant voluntarily participated in the tests once the oversight had been called to his attention.

Materials

The materials were events recorded by the participant. The participant recorded one event each day during a period of 9 months, and the event records were collected once each week. Also, the events had to meet the same restrictions as the events in the previous studies. His diary differed from the other long-term diaries only in the duration of the diary and the retention interval.

Procedure

The procedure for this experiment was similar to the procedure for the previous experiments. However, the retention interval for a given event in the present study could have been as great as 4.5 years.

Prerating

The ratings at the time the event was recorded were the same as the ratings made in the previous studies. Only the participant's rating of the pleasantness of the event will be considered in this paper. The participant rated the pleasantness of the event using a 7-point scale ranging from +3 for *very pleasant* to -3 *very unpleasant* (0 indicated neutral).

Testing

The events were read to the participant using a random order of presentation. In responding to each event, the participant determined whether the event was unique and provided a memory rating and a pleasantness rating for each event using the same scales given in the previous experiments.

Results

Change in pleasantness

Paired *t*-tests were used to compare initial and final pleasantness ratings for pleasant and unpleasant events. Again, events that were initially rated as neutral (i.e., a rating of 0) were not included in these analyses (approximately 5% of the data). Ratings for both pleasant and unpleasant events became less extreme when the initial and final pleasantness ratings were compared, $t(112) = 8.79$, $P < 0.01$ for pleasant events, $t(70) = 13.98$, $P < 0.01$ for unpleasant events. A significant effect of event pleasantness was noted such that there was a larger change in pleasantness ratings for unpleasant events than for pleasant events, $t(182) = 8.75$, $P < 0.01$. The third row of Table 1 presents the mean intensity ratings for pleasant and unpleasant events at both the time of recording the event and at the time of test for the 4.5-year retention interval.

As in the other two experiments, we also used a regression analysis to examine the differential fading of pleasant and unpleasant emotions across increasing retention intervals. The absolute difference between initial and final pleasantness ratings for each event was entered into a hierarchical regression analysis with three relevant predictors: event age, event pleasantness, and the Event Age \times Event Pleasantness interaction. A significant interaction between event age and event pleasantness was noted such that the unpleasantness associated with events faded more rapidly than the pleasantness associated with events, $F(1, 181) = 6.39$, $MSE = 0.69$, $p < 0.05$.

Effects of emotional intensity and pleasantness on memory ratings

A hierarchical regression analysis similar to that performed in the two previous experiments was used to assess the effects of initial emotional intensity and initial pleasantness on memory ratings. Events that were initially rated as neutral were not included in this analysis (5% of the data). Events of greater emotional intensity were remembered better than events of lesser intensity, $F(1, 181) = 22.07$, $P < 0.001$, $MSE = 0.96$. Event pleasantness did not significantly affect memory ratings after a 4.5-year retention interval, $F(1, 181) = 2.00$, $P > 0.05$, $MSE = 0.96$. The third row of Table 2 presents the mean final memory rating for pleasant and unpleasant events by intensity for the 4.5-year retention interval.

Initial versus final ratings in predicting memory ratings

A stepwise regression analysis similar to the one used in Experiments 1 and 2 was used. Six relevant predictors were included: linear event age, quadratic event age, initial emotional intensity, final emotional intensity, initial pleasantness, and final pleasantness. Final emotional intensity was the best predictor of final memory ratings, $F(1, 181) = 97.67$, $P < 0.001$, $MSE = 0.72$. Final pleasantness was the next best predictor of final memory ratings, $F(1, 181) = 9.02$, $P < 0.01$, $MSE = 0.99$. Initial emotional intensity was the third best predictor of final memory ratings, $F(1, 181) = 6.10$, $P < 0.05$, $MSE = 0.99$.

Combined analysis: change in emotional intensity over retention intervals

The absolute change in event affect data shown in Table 1 are also shown in Figure 1. The figure clearly suggests that emotional intensity fades more with increasing retention intervals, and that this effect is greater for unpleasant events than pleasant events. To provide statistical support for that apparent effect, we performed a regression analysis on the combined data from all three experiments. The absolute difference between initial and final pleasantness was entered into a hierarchical regression analysis with three predictors: pleasantness (pleasant or unpleasant), retention interval (3-month, 1-year, 4.5-years), and the Pleasantness \times Retention Interval interaction. An effect of pleasantness was found such that the emotional intensity for unpleasant events faded more than the emotional intensity for pleasant events, $F(1, 3693) = 22.73$, $P < 0.05$, $MSE = 0.94$. An effect of retention interval was also found such that longer retention intervals produced larger drops in emotional intensity, $F(1, 3693) = 4.22$, $P < 0.05$, $MSE = 0.94$. A significant Pleasantness \times Retention Interval interaction was noted such that as retention interval increased, unpleasant events showed larger drops in emotional intensity than pleasant events, $F(1, 3693) = 13.31$, $P < 0.05$, $MSE = 0.94$.

Discussion

The data supported two of our three hypotheses concerning the effects of retention interval on memory for pleasant and unpleasant events. First, both pleasant and unpleasant affects fade with time. The emotional intensity for unpleasant events fades more over time than does the emotional intensity for pleasant events. This finding was highlighted by the analysis of the combined data sets that showed this effect across all three retention intervals. Second, emotional intensity at the time of test was the best predictor of an event's memorability. The hypothesis that was not supported concerned superior memory ratings for pleasant events; memory ratings were similar for pleasant and unpleasant events.

GENERAL DISCUSSION

The data from these three experiments clearly show that the affective component of personal memory fades with increasing retention intervals. The systematic changes over retention intervals become obvious when the data are presented in terms of mean changes in emotional intensity. Figure 1 summarizes the mean change in intensity for pleasant and unpleasant events for all three retention intervals. It is clear that judgments of an event's pleasantness or unpleasantness became less extreme as the retention interval increased. Further, this change was always greater for unpleasant events than for pleasant events. Thus, unpleasant emotions fade more rapidly than pleasant emotions. These data also show that emotional intensity at the

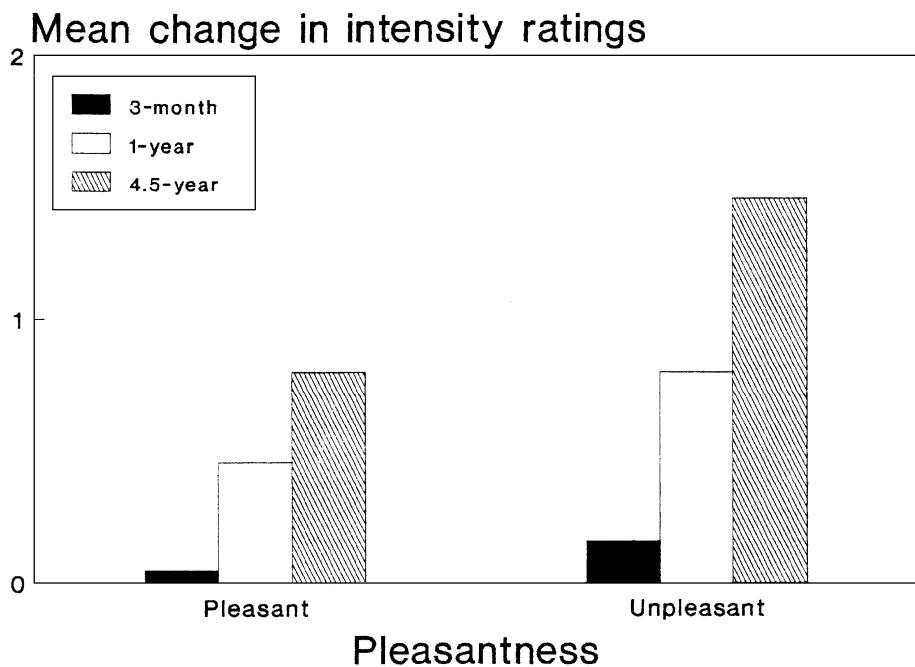


Figure 1. The mean change in intensity ratings for each retention interval plotted separately for pleasant and unpleasant events.

time of test was the best predictor of final memory ratings. Specifically, these data suggest that event memory is largely driven by emotional intensity, such that more emotionally intense events are remembered better than less emotionally intense events.

The final memory ratings in these data suggest that pleasant events are remembered better than unpleasant events. A modest effect of pleasantness on memory ratings was noted for two of the three data sets. As was stated earlier, this finding is consistent with the overall trend in the research: that pleasant events are recalled slightly better than unpleasant events (Bower and Gilligan, 1979; Brewer, 1988; Holmes, 1970; Linton, 1975; Matlin and Stang, 1978; Robinson, 1980; Thompson *et al.*, 1996; Wagenaar, 1986).

Our data show clear and consistent changes over time in the emotional intensity of events. These data are consistent with the results Holmes (1970) reported with a brief (1-week) retention interval and with Cason's (1932) findings using a retrospective procedure. Both the pattern of results and their consistency are worthy of note. As we stated in the introduction, the current study corrects for potential problems in the previous studies. We used much longer retention intervals to more adequately reflect the intervals found in autobiographical memory. We used a diary procedure to eliminate the errors in recall frequently found in the retrospective procedure used by Cason (1932). For an extended discussion of the advantages of the diary procedure, see Thompson *et al.* (1996). Finally, we used multiple retention intervals to avoid the possibility that changes in emotional intensity reported during test simply reflected regression toward the mean.

Theoretical implications

As mentioned earlier, there are a host of theories that address the issue of the effects of retention intervals on the recollection of pleasant and unpleasant memories. We noted that our data are relevant for these theories. In particular, we have chosen to examine the psychoanalytic concept of repression (Freud, 1900/1965) and Taylor's (1991) mobilization-minimization hypothesis. Both theories make speculations about how people cope with pleasant and unpleasant memories.

Freud (1900/1965) proposed that unpleasant events might be forgotten through the mechanism of unconscious repression. According to Freud's theory of repression, the memories of unpleasant events are repressed into the unconscious while the emotions associated with those memories remain intact to bother the conscious mind. Put more simply, unpleasant memories are forgotten but unpleasant emotions are not. The data from the present studies suggest just the opposite. While it is true that memory ratings for pleasant events were slightly higher than for unpleasant events, this effect was very small. Unpleasant emotions, however, did fade substantially more than pleasant emotions across all three retention intervals.

These data may also be described in terms of the short-term mobilization and long-term minimization hypothesis proposed by Taylor (1991). Specifically, the differential change in pleasantness ratings for pleasant and unpleasant events represents the minimization of unpleasant events. This minimization was specific in that the affect component of the memory was minimized while the overall memory remained intact. Engaging in the mobilization-minimization strategy is beneficial in many aspects. First, this strategy serves to cushion the self from the impact of

negative events. Experiences of failure and rejection are some of the most powerful events that people encounter. To maintain a generally positive self-concept in light of such events, people need to discount or re-evaluate many of these events. Second, this type of strategy can be employed to undo the social impact that negative events often have. This strategy may be directed at improving one's image in the eyes of others. The participant in Experiment 3 pointed out that there are strong social pressures to de-emphasize the negative events and focus on the positive.

Finally, we would suggest that our data are somewhat relevant in the broad context of the repressed memory/false memory debate. Critics of laboratory studies of memory reconstruction, which have found no evidence of repression, often point out that a more naturalistic study of memory is required (for differing opinions, see Cohler, 1993; Holmes, 1990; Lindsay and Read, 1993; Pezdek, 1993). The data from the present studies can be used to address this concern. Our results are consistent with a mechanism (e.g., mobilization-minimization) that effectively deals with unpleasant memories without invoking the concept of repression. Our data suggest that people deal specifically with the emotional aspects of unpleasant events while the memory for these events remains intact.

Freud (1900/1965) proposed repression as a means for the mind to cope with unpleasant events. While our data do not eliminate the possibility of repression, they fail to find any evidence supporting it. Instead, our data suggest an effective mechanism that allows people to cope with unpleasant memories without burying their past in their unconscious. These data suggest that event memory is largely driven by emotional intensity, such that more emotionally intense events are remembered better than less emotionally intense events. Freud argued just the opposite. According to psychoanalytic theory, emotionally intense unpleasant events would be repressed rather than remembered. In sum, these data suggest that unpleasant memories are not repressed. Instead, people minimize the emotional aspect of unpleasant memories while maintaining their overall memory of the events.

The data presented in this paper represent the effects of a mechanism that apparently allows people to effectively minimize the impact of unpleasant events. The emotion associated with unpleasant events fades faster than the emotion associated with pleasant events. Further, these data are consistent with the previous work of Cason (1932) and Holmes (1970). Taylor's (1991) mobilization-minimization hypothesis is also completely consistent with these findings.

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