

# Adult Attachment and the Defensive Regulation of Attention and Memory: Examining the Role of Preemptive and Postemptive Defensive Processes

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Previous research has found that avoidant adults have more difficulty recalling emotional experiences than do less avoidant adults. It is unclear, however, whether such findings reflect differences in the degree to which avoidant adults (a) attend to and encode emotional information, (b) elaborate emotional information they have encoded, or (c) do both. Two studies were conducted to distinguish between the effects of these processes. Participants listened to an interview about attachment-related issues and were asked to recall details from the interview either immediately or at variable delays. An analysis of forgetting curves revealed that avoidant adults initially encoded less information about the interview than did nonavoidant adults, although avoidant and nonavoidant adults forgot the information they did encode at the same rate. The implications of these findings for current views on the nature and efficacy of defenses are discussed.

The content and organization of our memories play key roles in shaping the way we view ourselves, the kinds of experiences we attend to, and the way we interpret our social world. According to attachment theory (Bowlby, 1973, 1969/1982), experiences in the context of close relationships are particularly influential in organizing memory. The knowledge structures, or working models, that develop in these contexts are thought to shape and constrain interpersonal behavior by providing rules of information processing and affect regulation and expectations about how others are likely to respond in a variety of situations (Collins & Read, 1994; Main, Kaplan, & Cassidy, 1985).

Researchers studying adult attachment have highlighted the role that defensive processes play in the functioning of working models (Fraley, Davis, & Shaver, 1998). Studies have shown that when people are asked to recall emotional events from early childhood, avoidant individuals (i.e., people who are uncomfortable being close to and dependent on others) recall fewer emotional memories than do other people, and the memories they do recall take longer to retrieve (Dorfman-Botens, 1994; Mikulincer & Orbach, 1995). There are at least two ways in which defensive processes might yield such findings. First, it might be that avoidant adults are less attentive to attachment-related experiences. If so, avoidant adults

should encode less information about these experiences and, consequently, have fewer memories to recall. In other words, defense mechanisms might operate preemptively to limit the amount of information that gets encoded. Second, it is also possible that avoidant individuals reflect less, and elaborate less, on emotional experiences they have encoded. If so, attachment-related memories would be less accessible, and avoidant individuals would have more difficulty than nonavoidant individuals in recalling them (Fraley et al., 1998). In other words, defense mechanisms might operate after the fact, or postemptively, to suppress or deactivate ideas and memories that have already been encoded.

Unfortunately, previous research has not been able to tease these explanations apart. The primary goal of the two studies reported here was to determine whether the relative difficulty avoidant adults have in recalling attachment-related experiences is due to (a) the defensive encoding of such experiences (i.e., preemptive defensive strategies); (b) the ways in which memories for those experiences are elaborated, rehearsed, or processed (i.e., postemptive defensive strategies); or (c) a combination of these two processes. Before describing the studies in detail, we briefly discuss recent research on adult attachment, elaborate on the distinction between preemptive and postemptive defensive strategies, and review empirical methods for separating the two processes.

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## Adult Attachment and Memory for Emotional Experiences

Recent research on close relationships, emotion regulation, and personality processes has been directed at parallels between infant and adult attachment dynamics (for reviews, see Feeney, 1999; Shaver & Clark, 1994). Specifically, researchers have investigated how attachment processes documented in childhood operate in adulthood, how they influence close relationships and emotion regulation, and how they might shape personality development. An important focus of this research is the identification of major patterns of variability in attachment organization. Recent investigations suggest that variability in attachment organization falls

along two dimensions: anxiety and avoidance (Brennan, Clark, & Shaver, 1998; Fraley & Shaver, 2000; Fraley & Waller, 1998; Griffin & Bartholomew, 1994a). The first dimension, anxiety, reflects variability in fear of abandonment and sensitivity to issues related to rejection and loss. The second dimension, avoidance, reflects variability in how uncomfortable people are with intimacy, closeness, and dependence.<sup>1</sup>

According to Fraley et al. (1998), avoidance is related to the organization of representational networks and cognitive strategies that limit the processing of attachment-related information. Data from several studies are consistent with this idea. For example, Mikulincer and Orbach (1995) asked participants to recall early childhood experiences involving times when they felt anxious, sad, angry, or happy. Highly avoidant individuals recalled fewer emotional memories than did other people. Moreover, avoidant adults took longer than others to retrieve the few memories they did recall. Dorfman-Botens (1994) noted similar recall patterns when participants were asked to recall childhood experiences specifically involving attachment figures. Avoidant individuals recalled fewer early experiences of feeling hurt and rejected by parents. Other results along these lines have been obtained by Mikulincer (1998) and Miller and Noiro (1999). In short, attachment-related memories are less accessible for avoidant adults.

This research has been interpreted as providing evidence for defensive processes: If attachment-related information is less accessible, it is less likely to be activated by ongoing interpersonal experiences and less likely to cause the avoidant individual to feel threatened or overly emotional. However, it is unclear from existing research whether avoidant individuals have fewer experiences to recall, are less attentive to the emotional events they experience, or process the information they acquire less elaborately. If the inaccessibility of attachment-related memories is motivated—that is, defensive in nature—it is important to discover the cognitive mechanisms underlying it.

### Preemptive and Postemptive Forms of Defense

To emphasize theoretical differences between the two kinds of defense mentioned above—failing to encode attachment-related information versus failing to reflect or elaborate on it after it is encoded—we will refer to these strategies as preemptive and postemptive defensive strategies.<sup>2</sup> Preemptive defenses minimize attention to events that might activate unwanted feelings or thoughts. An avoidant individual may, for example, choose not to get involved in a close relationship for fear of rejection, avert his or her gaze from an unpleasant sight, or “tune out” of a conversation that touches on themes associated with unpleasant feelings. In each of these cases, preemptive strategies limit the amount of information an individual encodes about an event. In contrast, postemptive defenses deactivate or inhibit thoughts that have already been encoded. For example, following a breakup, an avoidant person may suppress thoughts and memories of his or her former partner to prevent feelings of vulnerability. The majority of contemporary research on coping and emotion regulation has been aimed at understanding postemptive strategies. For example, researchers have studied problem-focused and emotion-focused coping strategies (Lazarus & Folkman, 1984), the suppression of unwanted thoughts (Wegner, 1989, 1994), and the regulation of negative emotions (Gross & Levenson, 1993).

The distinction between preemptive and postemptive defenses is important because the two kinds of mechanism have different implications for understanding the efficacy of defense and the psychological well-being of defensive individuals. If people are not attending to potentially painful events, they are, quite simply, less likely to be affected by them. Research has shown, for example, that people's heart rates decrease when they are encouraged not to focus on the painful implications of unpleasant visual materials (Lazarus, 1964; Lazarus, Speisman, Mordkoff, & Davison, 1964; Opton, Rankin, Nomikos, & Lazarus, 1965). In light of such findings, it appears that preemptive defenses may be a valuable way to keep attachment-related thoughts and feelings deactivated and may play an important role in shaping the memories that avoidant adults acquire. Furthermore, if a variety of emotional experiences are never encoded, there will be fewer opportunities for memories saturated with unwanted affect to be primed. Although the cumulative result of this process may be an emotionally flat individual, the defenses, arguably, will have achieved their goal of minimizing unwanted feelings.

In contrast, postemptive defenses may be less effective in regulating emotion and cognition. Indeed, research on thought suppression has found that attempts to suppress an existing thought can lead to an ironic increase in the accessibility of that thought (Wegner, 1989, 1994). According to Wegner (1989, 1994), suppression is ineffective for most people, because the monitoring and control mechanisms involved in the process activate or prime the very representation one is trying to avoid. Other researchers have found that the use of avoidant-like strategies is relatively ineffec-

<sup>1</sup> Readers may be more familiar with the classic three-category typology of secure, avoidant, and anxious-ambivalent individuals (Hazan & Shaver, 1987). Over the last few years, Bartholomew's (1990, Bartholomew & Horowitz, 1991) four-category typology has been adopted by many adult attachment researchers. According to Bartholomew's model, two latent dimensions, avoidance (also called model of other) and anxiety (also called model of self), define four theoretically distinct attachment patterns (secure, fearful-avoidant, preoccupied, and dismissing-avoidant). Security in Bartholomew's model is defined by low levels of avoidance and anxiety. Anxious-ambivalence, or preoccupation with attachment, is characterized by low levels of avoidance and high anxiety. The avoidant pattern in the three-category model is represented by two patterns in Bartholomew's model: fearful-avoidance and dismissing-avoidance. Both of these patterns are characterized by high avoidance but differ in anxiety. Fearful-avoidance is a combination of high avoidance and high anxiety; dismissing-avoidance is a combination of high avoidance and low anxiety. Here we focus primarily on the dimensions of avoidance and anxiety, rather than the attachment “types,” for three reasons. First, recent taxometric analyses indicate that attachment patterns are dimensional, not categorical (Fraley & Waller, 1998). Second, the dimensions of avoidance and anxiety conceptually map onto the dimensions uncovered by Ainsworth and her colleagues (Ainsworth, Blehar, Waters, & Wall, 1978) in studies of infant attachment (see Brennan et al., 1998). Third, Bartholomew's four attachment patterns can easily be conceptualized as additive linear combinations of the two dimensions, with no loss in conceptual precision. Please see Crowell, Fraley, and Shaver (1999) or Fraley and Shaver (2000) for further discussion.

<sup>2</sup> The distinction between these two processes is derived in part from a combination of Gross's (1998) contrast between antecedent-focused and response-focused emotion regulation and Bonanno and Singer's (1993) distinction between perceptual and reflective processing.

tive for people who have suffered loss, severe trauma, or a disaster (Bijttebier & Vertommen, 1999; Harrison & Kinner, 1998; Nolen-Hoeksema & Larson, 1999; but see also Bonanno, Keltner, Holen, & Horowitz, 1995). If avoidant individuals rely primarily on postemptive defensive strategies, they may be vulnerable to the unwanted or paradoxical effects of such strategies.

### Separating the Effects of Preemptive and Postemptive Defenses on Memory

If both preemptive and postemptive defensive strategies give rise to poorer recall of attachment-related events, how can we differentiate between them? One useful way to separate the effects of these two processes is to examine the way in which emotion-related information is forgotten over time. That is, by studying variation in the form of forgetting curves for attachment-related information, we can disentangle the effects of preemptive and postemptive defense on memory for emotional events.

The general form of classical forgetting curves (e.g., Wixted & Ebbesen, 1991) can be conveniently modeled as follows:

$$R = B_0 + (B_1 \times \log[t]), \quad (1)$$

where  $R$  represents the amount of information recalled and  $t$  represents the delay between learning the information and later attempting to recall it (i.e., the retention interval). This model has two important components. The term  $B_0$  represents the amount of information initially encoded and is akin to the y-intercept in a standard linear regression model.<sup>3</sup> Theoretically, this component is affected by the degree to which people attend to information (e.g., Slamecka & McElree, 1983); it should therefore be affected by the use of preemptive defensive strategies. The second component ( $B_1 \times \log[t]$ ) represents the rate at which information that has been encoded is forgotten over time.<sup>4</sup> The coefficient  $B_1$  is conceptually similar to the slope in a standard regression model. Theoretically, this component is affected by the degree to which people process, elaborate, and reflect on the information encoded. In other words, differences in the rates at which information is forgotten reflect differences in the use of postemptive defensive strategies.

To illustrate the effects of these kinds of defenses on the form of forgetting curves, consider the following examples. Suppose we present two people, one avoidant and the other nonavoidant, with the same distressing situation and later test their memories for the details of the experience.<sup>5</sup> If the avoidant individual was less attentive to the details of the experience than was the nonavoidant individual, then we would expect him or her to recall less information about the experience when tested immediately afterward. Further, if we were to test each individual repeatedly at variable delays (e.g., 1 hr, 1 day, 1 week, or 1 month after the experience), we would find that the forgetting curves for the two individuals decayed at the same rate. These findings would constitute evidence that the avoidant individual encoded less information initially and was not differentially elaborating or forgetting the information over time. Hypothetical forgetting functions illustrating this example are presented in Panel A of Figure 1. The value of the  $B_0$  parameter for the avoidant function is lower ( $B_0 = 20$ ) than the value of  $B_0$  for the nonavoidant function ( $B_0 = 28$ ), reflecting the fact that the avoidant individual recalled less information when tested immediately after the experience (i.e., when  $t$  was small).

However, both functions have identical values for  $B_1$  ( $B_1 = -1.5$ ), indicating that both people forgot the information at the same rate.

Assume now that we repeat the experiment, but this time the avoidant individual is just as attentive to the experience as his or her nonavoidant counterpart. Afterwards, however, the avoidant individual does not rehearse the event, fails to elaborate on it, and perhaps even tries actively to keep from thinking about it. In this case, we would expect him or her to recall just as much information about the experience as the nonavoidant individual when tested immediately after the experience (i.e., when  $t$  was small), because they were equally attentive to the information. Over time, however, the avoidant person would recall less of the information than the nonavoidant individual because he or she was not continuing to process or rehearse it (see Panel B of Figure 1). In other words, the avoidant person would forget the information at a faster rate ( $B_1 = -6.5$  vs.  $-1.5$ ). Although the two people began with equivalent levels of knowledge (the value of  $B_0$  was 28 for both individuals), their respective forgetting functions would diverge over time because of the differential use of postemptive defensive strategies.

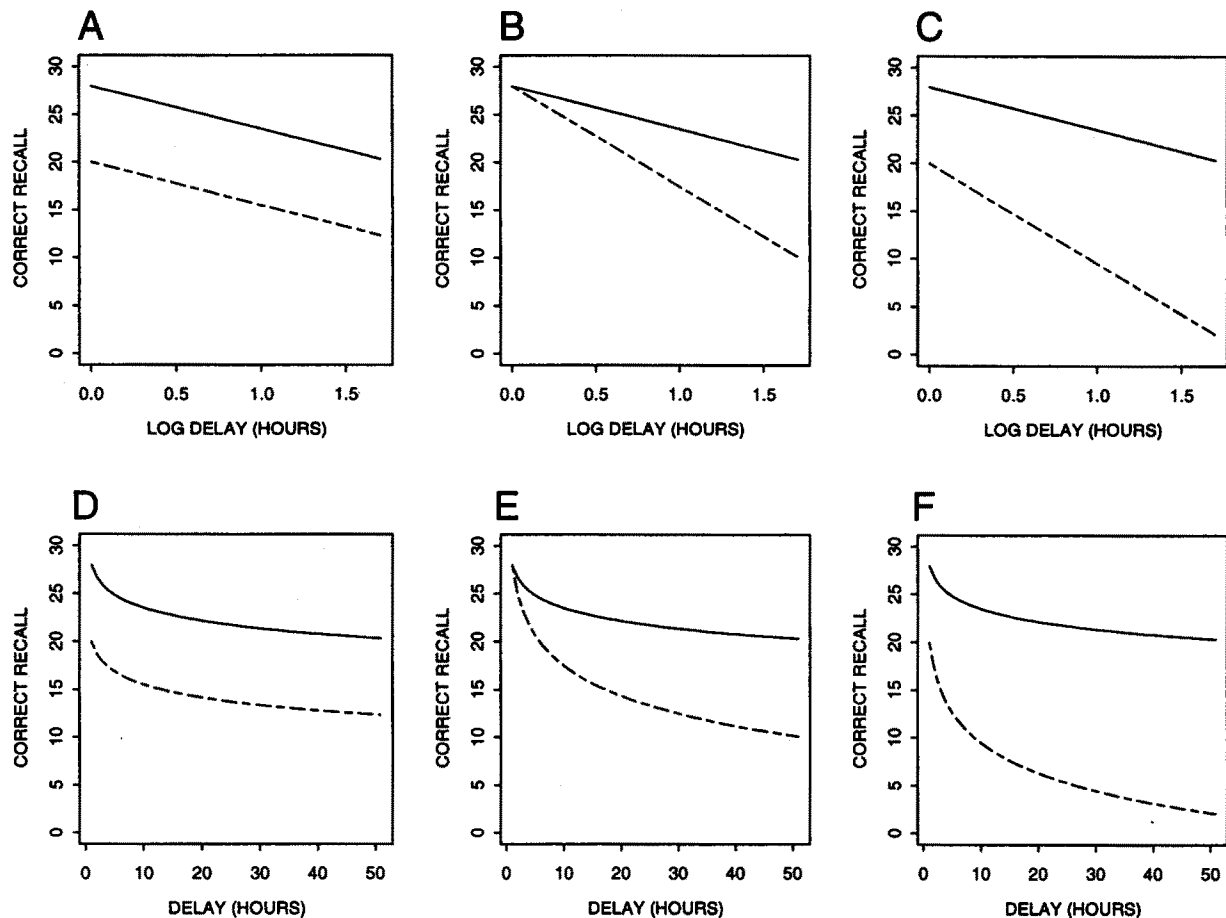
Finally, assume that the avoidant individual adopts both preemptive and postemptive defensive strategies: He or she does not attend to the information very carefully during the experience and also fails to elaborate on it afterwards. In this case, we would expect the avoidant person to recall less information immediately after the experience and recall increasingly less information over time (see Panel C of Figure 1). In other words, the avoidant person's forgetting function would start at a lower level ( $B_0 = 20$ ) than the nonavoidant person's function ( $B_0 = 28$ ) and decay at a faster rate ( $B_1 = -6.5$  vs.  $-1.5$ ).

How can the parameters of this model be estimated? When the delay interval is in a logarithmic metric, as described in Equation 1, the relationship between time and recall is linear, and the values of  $B_0$  and  $B_1$  can be estimated easily within a linear regression framework. Nonetheless, it is often helpful to visualize the relationship between recall and time in the curvilinear manner

<sup>3</sup> Mathematically, the logarithm approaches negative infinity as  $t$  approaches 0. Therefore, the y-intercept interpretation does not technically hold for logarithmic forgetting curves because the y-intercept is defined as the value of  $y$  when time equals 0. Nonetheless, we will retain the y-intercept interpretation of  $B_0$ , because this term can be viewed as the value of  $y$  that is approached when the retention interval ( $t$ ) is slightly greater than 0 (e.g.,  $t = 1$ ).

<sup>4</sup> Although there are a variety of ways to model the relationship between time and memory (e.g., using linear, exponential, logarithmic, or power functions), logarithmic and power functions appear to provide the best fit to a variety of memory data (see Wixted & Ebbesen, 1991). We have focused on logarithmic rather than power functions because, as we will demonstrate later, they are easily manipulated to incorporate individual difference parameters. (See Fraley, 1999, for a detailed discussion of several mathematical models of forgetting.)

<sup>5</sup> Throughout this article we will refer to people high on the dimension of avoidance as "avoidant" and people low on the dimension as "non-avoidant." The use of this language should not be taken to imply that we believe that avoidance is a categorical domain (see Fraley & Waller, 1998, for taxometric evidence concerning the dimensionality of adult attachment styles). Instead, we use these terms strictly for linguistic convenience. In all of the data analyses reported in this article, avoidance will be conceptualized and analyzed as a continuous variable.



*Figure 1.* Forgetting curves under three hypothetical conditions: (a) Avoidant adults (dashed line) encode less information than nonavoidant adults (solid line) but forget the information at the same rate (Panels A and D); (b) avoidant adults encode the same amount of information as nonavoidant adults but forget the information at a faster rate (Panels B and E); and (c) avoidant adults encode less information than nonavoidant adults and forget the information at a faster rate (Panels C and F). The panels on the top row represent the linear forgetting curves; the panels on the bottom row represent the curvilinear versions of the same curves.

in which forgetting curves are typically presented (i.e., when time is not log transformed). Panels D, E, and F of Figure 1 illustrate the nonlinear versions of the forgetting curves from our previous examples. As can be seen in Panel D, the curves have different y-intercepts, indicating that the individuals initially encoded different levels of information. The curves decay at the same rate, however, indicating similar rates of forgetting (cf. Panel A). In Panel E, the curves have identical intercepts, indicating that the individuals initially encoded the same amount of information. However, the curves decay at different rates, indicating different rates of forgetting (cf. Panel B). In Panel F, the curves have different intercepts and different slopes, suggesting that the two people differ in the amount of information they acquire and the rate at which that information is forgotten (cf. Panel C).

#### Overview of the Present Studies

The goal of the present studies was to determine whether the relative inability of avoidant adults to recall emotional experiences

stems from the use of either preemptive or postemptive defensive strategies or from some combination of the two. Previous researchers, as explained above, have investigated the links between attachment and memory by instructing participants to recall emotional experiences from their personal past. One limitation of this method is that people may vary in the number of emotional events they have experienced (or the number of times they have allowed themselves to react emotionally to events). To control for such variation, we exposed participants to the same emotional event. Specifically, participants were instructed to listen to a highly engaging tape-recorded interview of a woman truthfully describing attachment-relevant issues (e.g., intimacy and loss). Furthermore, all participants were administered the same cued-recall test to probe their memory for the details of the interview. This method allowed us to rigorously examine the role of defensive processes in memory for an emotional event.

In Study 1, we sought to determine whether our method would generate findings similar to those reported previously in the liter-

ature. Specifically, we sought to determine whether avoidant adults would recall less information about attachment-related experiences than would nonavoidant adults. In Study 2, we sought to separate the role of preemptive and postemptive defensive processes in memory for attachment-related experiences by examining forgetting curves.

### Study 1

To determine whether avoidant adults have a more difficult time recalling attachment-related information than nonavoidant adults, we asked participants to listen to a tape-recorded interview describing attachment-related themes (i.e., attachment and loss), and then we tested their memory for details of the interview.

For all significance tests reported below, we used an alpha level of .05. We made the assumption, on the basis of previous research (e.g., Mikulincer & Orbach, 1995), that the association between avoidance and recall would fall between .25 and .30. Given this assumption, a sample size of approximately 100 was necessary to obtain power greater than or equal to 80% (Cohen, 1988).

### Method

**Participants.** One-hundred two undergraduates were recruited to participate in a study called "Listening to Tapes" in exchange for credit in their psychology courses. Sixty-five percent of the participants were women.<sup>6</sup> The mean age was 20.4 years ( $SD = 1.8$ ).

**Procedure.** Participants were tested individually. After arriving at the laboratory, they were asked to complete a questionnaire containing demographic items and the Relationship Styles Questionnaire (RSQ; Griffin & Bartholomew, 1994b), a 30-item measure of adult attachment organization. Responses to the RSQ items were aggregated in the way described by Fraley and Waller (1998) to create scores for the dimensions of anxiety and avoidance. In previous studies in our laboratory, these RSQ scales have exhibited test-retest reliabilities above .70 over a 3-week period. The internal consistency estimates of reliability in the present study were .71 and .86 for anxiety and avoidance, respectively.

After completing the questionnaire, participants were told they would be listening to a tape-recorded clinical interview of a woman describing her family relationships. The interview was constructed by the authors to touch on attachment-related themes, including intimacy, separation, and loss. In the interview, a young woman, "Jennifer," truthfully describes (a) several of her most memorable childhood experiences with her sister (e.g., experiences that made them feel close and interdependent), (b) the premature, relatively recent death of her sister, and (c) the ways in which her sister's death has affected her life. Participants listened to the 20-min interview alone. When the tape was over, the experimenter returned to the room and asked the participant 30 cued-recall questions concerning details from the interview (e.g., "How old was Jennifer when her sister died?" "What musical instrument did Jennifer and Mary play when they were little?" "What were Jennifer and Mary celebrating when they last saw each other?"). After participants completed the test, they were fully debriefed and thanked.

### Results and Discussion

The dependent variable was the number of questions the participants correctly answered concerning the details of the interview. On average, participants answered 25.3 of the 30 cued-recall questions correctly ( $SD = 4$ ).

To determine whether avoidant adults recalled less information from the attachment-related interview, we examined the correlation between avoidance and recall. Consistent with our hypothesis, avoidance correlated negatively with recall ( $r = -.30, p < .05$ ). Anxiety correlated only  $-.08$  with recall. Because anxiety and avoidance, as measured in Study 1, were positively correlated with each other in this sample ( $r = .39$ ), we also estimated a regression model in which anxiety and avoidance were entered as simultaneous predictors of recall. The overall model accounted for 9% of the variance in recall,  $F(2, 101) = 4.81, p < .05$ . Avoidance negatively predicted recall ( $B = -1.27, \beta = -.31, p < .05$ ), whereas anxiety had virtually no association with recall ( $B = .18, \beta = .05$ ). Because the distinction between dismissing and fearful avoidance, often made in studies of adult attachment, is based on a difference in anxiety between people who are equally avoidant, the failure of the anxiety dimension to influence memory in Study 1 means that there was no difference between theoretically dismissing-avoidant and fearful-avoidant individuals.

In summary, highly avoidant individuals recalled fewer details than less avoidant individuals about an attachment-related emotional interview they had just heard.<sup>7</sup> This finding conceptually replicates previous research on attachment and memory (e.g., Mikulincer & Orbach, 1995). Furthermore, it provides preliminary evidence that preemptive defenses play a role in the encoding of emotional memories for avoidant adults. Nonetheless, forgetting curves are needed to tease apart the influence of preemptive and postemptive processes.

### Study 2

In Study 2, we sought to separate the influence of preemptive and postemptive processes in memory for emotional events. The procedure used in Study 1 was modified to incorporate a variable-delay interval between listening to the interview and being tested for details concerning it. This allowed us to determine, within a

<sup>6</sup> In general, women tended to recall more information from the interview than men ( $r = .21, p < .05$ , in Study 1, and  $r = .12, ns$ , in Study 2). It may be the case that women found it easier than men to identify with the female interviewee and therefore retained more of the information. This may also reflect the general finding that women are, in general, more attuned to relational and emotional material (see Brehm, 1992). The results reported below remain the same when gender and its interactions with other predictors are incorporated into the models.

<sup>7</sup> We attempted to separate the memory questions into a variety of classes (e.g., questions about emotional versus mundane aspects of the interview, questions about positive versus negative emotional experiences) to see if the memory effects were specific to certain classes of issues. Regardless of how we partitioned the questions, we did not find a tendency for avoidant individuals to recall differentially certain kinds of information. Highly avoidant individuals had poorer memory for all details from the interview. We suspect that highly avoidant individuals, as soon as they noticed that the interview was concerned with emotional topics (i.e., bonding, intimacy, and loss), began to pay less attention to the interview more generally. The consequence of this is that they encoded fewer emotionally relevant and emotionally irrelevant details from the interview. We doubt that highly avoidant individuals listened to the interview carefully enough to continuously and selectively tune in and out as a function of the specific topic being discussed.

between-subjects design, the influence of avoidance on the encoding of information and the differential decay of information over time.<sup>8</sup> To uncover the influence of avoidance on these two processes, we estimated the following model:

$$R = B_0 + (B_1 \times \log[t]) + (B_2 \times \text{Avoidance}) + B_3(\log[t] \times \text{Avoidance}), \quad (2)$$

where  $R$  represents the number of questions correctly answered concerning the details of the interview,  $B_0$  represents the amount of information encoded (i.e., the intercept),  $B_1$  represents the rate at which the information is forgotten over time,  $B_2$  represents the degree to which avoidance influences the amount of information encoded (i.e., the intercept), and  $B_3$  represents the degree to which avoidance affects the rate at which information is forgotten over time.

The terms in Equation 2 can be algebraically recombined to highlight the contribution of each term to the overall intercept and slope of the forgetting function:

$$R = (B_0 + B_2 \times \text{Avoidance}) + (B_1 + B_3 \times \text{Avoidance})\log(t) \quad (3)$$

Notice that Equation 3 is similar to Equation 1. In fact, if we let  $B_0$  from Equation 1 equal  $(B_0 + B_2 \times \text{Avoidance})$  and  $B_1$  from Equation 1 equal  $(B_1 + B_3 \times \text{Avoidance})$ , simple substitution shows that the two equations are identical. This arrangement demonstrates that individual differences in avoidance can be assimilated easily into our original model of forgetting and that the parameters of the model can be estimated within a familiar linear regression framework involving a constant, two variables (i.e.,  $\log[t]$  and avoidance), and the interaction between these two variables (i.e.,  $\log[t] \times \text{Avoidance}$ ). If avoidance has no effect on initial levels of encoding, then  $B_2$  will equal 0, and the y-intercept ( $B_0$ ) will not reflect the influence of avoidance. Similarly, if avoidance has no influence on forgetting rate, then  $B_3$  will equal 0. If both  $B_2$  and  $B_3$  are 0, the model is identical to Equation 1 and will yield forgetting curves that are uninfluenced by individual differences in attachment.

As in Study 1, all significance tests were based on an alpha level of .05. To determine the number of participants needed to assure power of approximately 80%, we made the following assumptions: (a) the standardized effect of time on recall,  $\beta_1$ , would be moderately strong, approximately .40; (b) the effect of avoidance on recall,  $\beta_2$ , would be .30, as was found in Study 1; and (c) the interaction between avoidance and time,  $\beta_3$ , would be moderate to small, about .15. By generating simulated data from this population model over thousands of trials, and under variations of these basic parameter estimates, we determined that a sample size of 200–250 would be necessary to have a power of 80% or greater for detecting an interaction.<sup>9</sup> Given this sample size, the power for detecting an effect of avoidance on recall is greater than 99%.

## Method

**Participants.** Two-hundred twenty-nine previously untested undergraduates were recruited to participate in a study called "Listening to Tapes" in exchange for credit in their psychology courses. Seventy-nine

percent of the participants were women. The mean age was 19.6 years ( $SD = 2.6$ ).

**Procedure.** Participants were tested in groups ranging in size from 1 to 6 people. After arriving at the laboratory, they completed a consent form and were told that they were participating in a two-part study, which meant that we would need to know their phone numbers and the days and times when they could be reached to be scheduled for the second part. All participants provided the necessary information. They then completed a questionnaire containing demographic items and the Experiences in Close Relationships inventory (ECR; Brennan et al., 1998), a 36-item measure of the avoidance and anxiety dimensions.<sup>10</sup> The internal consistency estimates of reliability in the present study were .91 and .92 for anxiety and avoidance, respectively.

After completing the questionnaire, participants were told they would be listening to a tape-recorded clinical interview of a woman describing her family relationships. Participants then listened to the same 20-min interview used in Study 1. To ensure that a sufficient number of participants would be available for immediate testing (to establish the level of recall at small values of  $t$ ), we randomly designated two-fifths of the participants in the study sessions to be tested right after the interview. This process resulted in 98 individuals (42% of the sample) being assigned to the immediate testing condition. The remainder of participants were administered the 30 cued-recall questions over the telephone at various delay intervals. Overall, the delay between hearing the interview and being tested ranged from 0.05 hr (i.e., approximately 3 min after hearing the interview for people assigned to be tested immediately after hearing the interview) to 504 hours (approximately 21 days), with a mean of 87 hours or approximately 3 days. It is important to note that avoidance and anxiety were not significantly correlated with the length of the delay interval ( $r_s = -.07$  and  $-.11$ , respectively). (They were also uncorrelated with each other,  $r = .03$ .) After participants answered the questions, they were fully debriefed and thanked.

## Results and Discussion

The dependent variable was the number of questions concerning the details of the interview that a participant correctly answered.

<sup>8</sup> We adopted a between-subjects rather than a within-subjects design for this study for several reasons. First, in a within-subjects design we would require a different set of questions for each testing session to ensure that learning, rehearsal, and other retest artifacts were not contaminating the results. Such tests are difficult to devise not only because one would need to generate a large question pool, but also because one would need to ensure that the difficulty of the items was uncorrelated with the time of administration. Second, a large number of assessment periods would be required to obtain precise estimates of forgetting functions for a single individual. This would pose a number of practical and economic problems that would make it difficult to recruit and retain research participants. The between-subjects design allowed us to deal with all of these issues in a straightforward manner. The same questions could be administered to all participants, there was no possibility of retest artifacts, and we could sample multiple retention intervals economically.

<sup>9</sup> The weight for the error term used in these simulations was the square root of 1 minus the variance accounted for by the other terms, where the variance accounted for was determined by summing the elements of the variance-covariance matrix of all the weighted predictors (see Cliff, 1987, on the variance of a weighted composite).

<sup>10</sup> The ECR was not published when we designed Study 1. Because psychometric evidence indicates that the ECR is a more precise instrument than the RSQ (Brennan et al., 1998; Fraley, Waller, & Brennan, 2000), we used the ECR in Study 2.

On average, participants recalled 21.4 of the 30 questions correctly ( $SD = 6.4$ ) with scores ranging from 4 to 30.

We first estimated a regression model with first-order terms, in which recall was modeled as a function of the log-transformed delay interval and standardized avoidance scores:  $R = B_0 + (B_1 \times \log[t]) + (B_2 \times \text{Avoidance})$ . This model accounted for 64% of the variance in recall,  $F(2, 224) = 200.90, p < .05$ . The constant (i.e., the average recall for a person with an average score on avoidance when the delay interval was 0) was 27.12, indicating that the level of recall immediately after hearing the interview was high. Recall decreased, however, as a log-linear function of the delay interval ( $B_1 = -4.87, \beta_1 = -.80, p < .05$ ). Importantly, recall was lower for highly avoidant individuals ( $B_2 = -.58, \beta_2 = -.09, p < .05$ ), consistent with the idea supported in Study 1 that avoidant individuals were less attentive to attachment-related information while listening to the interview.

To determine whether memory decayed at a different rate for highly avoidant individuals, we reestimated the model but added a term representing the interaction between delay interval and avoidance (i.e., we estimated all of the parameters in Equation 2). The new parameter estimates for the delay interval and avoidance were similar ( $B_1 = -4.87$  for time and  $B_2 = -.56$  for avoidance). Including the interaction, however, did not significantly improve the fit of the model ( $\Delta R^2 < .001, F(1, 223) = .009, ns$ ). The estimated regression coefficient for the interaction term,  $B_3$ , was  $-.02 (\beta_3 = -.01)$ . Figure 2 illustrates the estimated forgetting curves for the full model for individuals 1 standard deviation above and 1 standard deviation below the mean on avoidance. As can be seen, the curves have different intercepts (because avoidant individuals recalled less information initially) but highly similar slopes.

Although the results of Study 1 indicated that anxiety was unrelated to recall, we also examined the parameters of the model with anxiety included. Specifically, we estimated the following model:

$$R = B_0 + (B_1 \times \log[t]) + (B_2 \times \text{Avoidance}) + (B_3 \times \text{Anxiety}) + B_4(\log[t] \times \text{Avoidance}) + B_5(\log[t] \times \text{Anxiety}) \quad (4)$$

When we estimated the coefficients for the first-order terms, the rounded estimate of  $B_3$  was 0 ( $B_3 = 0.00, \beta_3 = .00$ ), indicating that anxiety had no effect on the amount of information encoded. When we added the interactive terms, the coefficient for the  $\log(t) \times \text{Anxiety}$  interaction was small and not statistically significant ( $B_5 = -0.32, \beta_5 = -.08$ ). Overall, it appears that anxiety had virtually no effect on the amount of attachment-related information people encoded or the rate at which they forgot the information they did encode. As mentioned with respect to the results of Study 1, this failure of anxiety to affect memory means that there was no difference in memory between what are often called dismissing-avoidant individuals and fearful-avoidant individuals.

In summary, highly avoidant individuals recalled fewer details about the emotional interview than nonavoidant individuals, regardless of the delay between hearing the information and being asked to recall it. These results suggest that avoidant individuals were less attentive to attachment-related emotion initially but did not necessarily forget the information at a faster rate than nonavoidant individuals. In other words, the organization of emotional memories for avoidant adults appears to reflect the use of preemp-

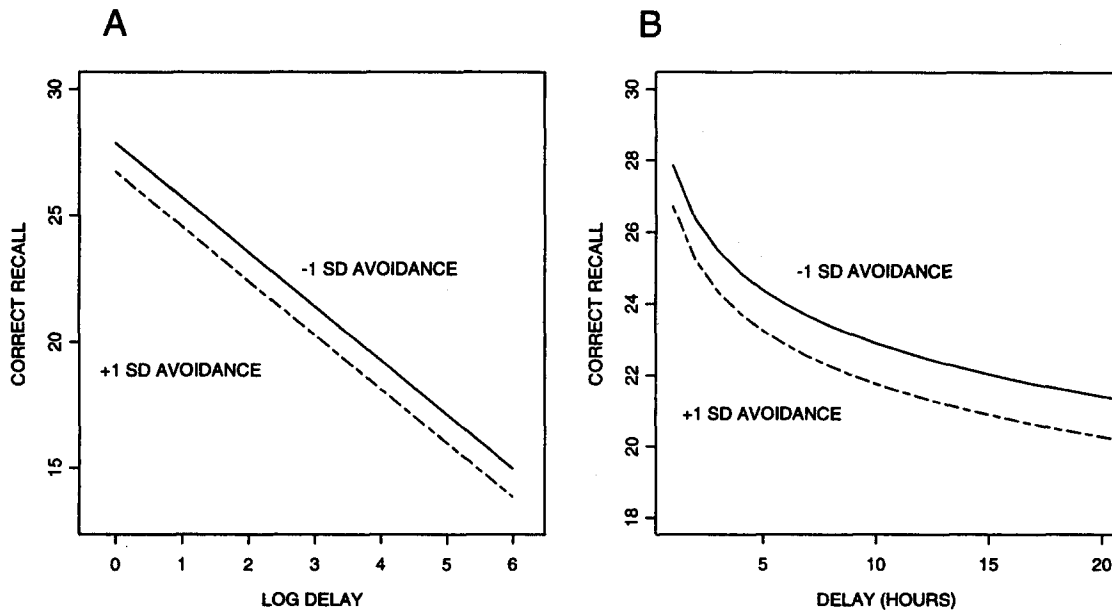


Figure 2. Estimated forgetting curves for individuals 1 standard deviation above the mean on avoidance (dashed line) and 1 standard deviation below the mean on avoidance (solid line). Panel A illustrates the linear forgetting curves; Panel B illustrates the curvilinear forms of the same curves over a limited range of retention intervals. As can be seen, highly avoidant individuals initially encoded less information than individuals low in avoidance, but they forgot the information at a similar rate.

tive defensive strategies rather than the use of postemptive strategies.

### General Discussion

In recent years, a number of researchers have become interested in the role of basic memory processes in the regulation of attachment behavior. Previous studies have shown that highly avoidant people recall fewer emotional memories when asked to recall early childhood experiences (Dorfman-Botens, 1994; Mikulincer & Orbach, 1995). Our goal here was to tease apart the effects of two kinds of defenses that might affect memory for attachment-related emotional events: preemptive defenses (i.e., defensive processing of information during encoding) and postemptive defenses (i.e., defensive processing of information already encoded). Our findings suggest that the relatively poor recall of emotional experiences on the part of avoidant adults is due to defenses of a preemptive nature. In other words, avoidant adults appear to be less attentive to emotional events while those events are occurring; consequently, they encode less of the information available to them.

These results raise several questions. First, what do the findings imply regarding the efficacy of defense in avoidant adults, and how might preemptive defenses facilitate the construction and maintenance of emotionally shallow memory structures? Second, are there ways in which information can be encoded without people having conscious access to it? That is, are there ways that preemptive defenses may be bypassed despite an individual's intentions?

### *The Efficacy of Avoidant Adults' Preemptive Defenses*

In the literature on adult attachment (e.g., Dozier & Kobak, 1992; Hesse, 1999; Klohnen & John, 1998; Kobak & Sceery, 1988; Mikulincer & Orbach, 1995), avoidant individuals are often portrayed as brittle, hostile, and emotionally vulnerable. Our analysis of defense, however—here and in previous writings (Fraley et al., 1998; Fraley & Shaver, 1997, 1999)—suggests that the kinds of defenses used by avoidant individuals may be relatively effective in “deactivating” the attachment system. These defenses may therefore short-circuit many potentially emotional experiences, including experiences that may threaten the individual's sense of independence or self-worth. Avoidant individuals appear to be particularly good at turning their attention away from troubling attachment-related thoughts and at the same time defusing the autonomic arousal associated with such thoughts (Fraley & Shaver, 1997). They have also shown that they do not become attached easily to their romantic partners (Fraley & Davis, 1997; Fraley et al., 1998). Preliminary evidence suggests that avoidant individuals dislike psychologically intimate aspects of sexual intercourse (e.g., mutual gazing, cuddling) and are more likely than less avoidant individuals to fantasize about someone other than their current sexual partner while engaged in intercourse with that partner (Fraley et al., 1998; Hazan, Zeifman, & Middleton, 1994). Such defenses may be relatively effective in regulating affect and experience when they operate preemptively to block or limit the kind and amount of information a person acquires.

How might preemptive defenses create and sustain a “detached” representational system? As discussed previously, these systems

initially acquire this detached quality when an individual limits the number of emotional events he or she attends to and processes. The failure to attend to emotional experiences constrains the degree to which one can create a detailed, rich, or sophisticated representation of attachment-related emotional experiences. Further, it seems likely that this process can feed back on itself to help maintain an effective defensive stance. According to Collins and Read (1994; Collins, 1996), the representations one holds with respect to attachment play a “top-down” role in guiding the kinds of information one attends to and selects for further processing. Thus, an individual with fewer attachment-related memories will be less likely to recognize the emotional implications of interpersonal events and attend to them. In these respects, preemptive defenses may play an important role in the construction and maintenance of a relatively detached state.

Although the use of preemptive defenses may help to keep the attachment system relatively deactivated, it is noteworthy that there is considerable variability in the emotional experiences of avoidant individuals, and there may be other factors at work that counter or facilitate the use of such defenses. According to contemporary two-dimensional models of individual differences in attachment organization (e.g., Brennan et al., 1998; Fraley & Shaver, 2000; Griffin & Bartholomew, 1994a), the degree to which an individual is avoidant is theoretically distinct from the degree to which he or she is chronically anxious about attachment-related concerns. Thus, some people can be highly avoidant but also highly anxious. Bartholomew labeled this combination of avoidance and anxiety *fearful-avoidance*. Fearfully avoidant adults are uncomfortable with closeness and dependence yet they fear rejection or abandonment in close relationships (Bartholomew, 1990; Bartholomew & Horowitz, 1991). Although our data suggest that fearful individuals are less attentive to emotional information, other evidence indicates that they cannot use defenses to their advantage, possibly because they have an explicit sensitivity to emotional concerns. In fact, in previous research we found that, although highly avoidant individuals were able to deactivate negative emotions, highly anxious people had difficulty doing so (Fraley & Shaver, 1997). Thus, the effects of anxiety and avoidance on an individual's emotional state appear to oppose each other and may lead to some degree of inefficacy in the defenses of fearful individuals who are high on both dimensions. It is noteworthy in this respect that fearful individuals report relatively high levels of psychopathology (Brennan & Shaver, 1998), abuse (Dutton, Saunders, Starzomski, & Bartholomew, 1994), and unsatisfying interpersonal relationships (Roberts & Noller, 1998).

Dismissing-avoidant individuals, on the other hand, are characterized by a combination of high avoidance and low anxiety. Dismissing individuals claim that they do not want to be emotionally close to others but, in contrast to fearful people, do not explicitly worry about rejection or abandonment. Although observers and peers tend to consider dismissing adults to be cold and, sometimes, hostile (Bartholomew & Horowitz, 1991; Kobak & Sceery, 1988), it appears that they can use preemptive defenses to their advantage. For example, dismissing-avoidant adults are able to deactivate unwanted emotions relatively effectively (Fraley & Shaver, 1997). Furthermore, they do not get particularly distraught following the end of a relationship (Sprecher, Feinlee, Metts, Fehr, & Vanni, 1998) and report fairly high levels of self-esteem (Bartholomew & Horowitz, 1991; Shaver et al., 1996). Although



the repeated use of preemptive defenses may eventually cause a dismissingly avoidant person to appear emotionally blunted, it could be argued that he or she is less emotionally fragile than otherwise would be the case. In this sense, defenses may be operating effectively for the dismissing individual, but in a way that leads peers or relationship partners to feel uncomfortable or dissatisfied (Fraley et al., 1998; Fraley & Shaver, 1999).

### *Explicit Versus Implicit Memory for Attachment-Related Emotional Events*

Although our findings indicate that highly avoidant individuals have a relatively difficult time recalling emotional information, it is important to note that our methods did not allow us to separate the roles of implicit and explicit processes in remembering. The distinction between these kinds of processes has received a great deal of attention in cognitive psychology during the last decade (e.g., Roediger, 1990) and may have important implications for understanding the memory dynamics of avoidant adults. For example, recall is thought to reflect a combination of implicit and explicit processes (Jacoby, Toth, Lindsay, & Debnar, 1992). People may recall details of previous experiences either because they consciously recollect the actual experience or because they simply feel that they "know" the information. If avoidant adults are less attentive to the information they acquire, their recall may be due to this vague "feeling of knowing" rather than to explicit recollection. A number of methods have been developed to separate these two kinds of effects, and future research on attachment may benefit from using them. One commonly used memory technique, the "remember-know method," involves instructing research participants who recognize previously learned information to indicate whether they remember or recollect having learned the information previously or whether they just feel like they know they have seen the information before (Gardiner & Java, 1993; Tulving, 1985). This simple method has the potential to provide a number of insights about the ways in which implicit and explicit processes affect recall, and it may even shed light on systematic errors in recollection (e.g., erroneous inferences about the source of information previously acquired; see Schacter, 1999).

The implicit-explicit distinction also has implications for understanding the mechanisms underlying information not recalled. For example, people may have acquired knowledge for an event, and that knowledge may influence behavior in subtle ways—even though people cannot consciously retrieve it. In some cases, such failures in remembering may reflect the probabilistic nature of memory. For example, Klein, Loftus, and Schell (1994) and Erdelyi (1996) have independently shown that information previously unavailable for recall can later be retrieved fairly easily if a person is asked to attempt recall on more than one occasion. In other cases, failures to recollect may reflect something deeper. It may be that the information is encoded in some form but the wrong kinds of recall cues are available (Tulving & Thomson, 1973). When this is the case, knowledge that is not consciously accessible may still influence a person's behavior and experience without the person being aware of it. Although Bowlby (1980) speculated on these matters and their implications for defense and psychopathology, a number of methods now exist that would allow his ideas to be tested more rigorously. For example, stem-completion tests are commonly used as an index of implicit memory. Although these

kinds of tests have been criticized by some writers (e.g., Jacoby et al., 1992), appropriately modified versions of this kind of test could be used to determine whether emotional experiences influence memory performance even when individuals are not able to consciously recollect relevant details.

It is also of interest to consider whether preemptive strategies can be activated nonconsciously, without a person's awareness. There is little doubt in our minds that preemptive defenses can be initiated by conscious volition. People commonly choose not to watch movies that they know will make them anxious or sad, they avert their gaze from individuals with whom they do not wish to interact, and they avoid reminders of deceased loved ones that could provoke unwanted feelings. A challenge for future research will be to determine (a) the extent to which these kinds of defensive maneuvers can be activated without the individual's awareness that he or she is behaving in a defensive manner and (b) whether people of different attachment orientations vary in the degree to which these defenses can be initiated or carried out nonconsciously.

### *Advantages and Limitations of the Present Studies*

There are several noteworthy features of the research presented here. First, in attempting to understand the nature of defensive processes underlying the memory performances of avoidant adults, we held constant the "objective" experience that participants were asked to recall. In other words, all participants were exposed to the same event. If we had asked people to recall personal experiences from their own past, they might have varied in the number of emotional events they had experienced, and this variation would have been confounded with avoidance. In other words, a lack of recall on the part of avoidant adults might have been a reflection of the number of emotional events they had experienced rather than an indicator of defensive memory processes. By exposing everyone to the same event and testing them about it in the same way, we were able to investigate rigorously the influence of defenses on memory. Also, by examining recall over time (i.e., by studying forgetting curves for emotional information), we were able to separate the effects of preemptive and postemptive defense on memory for emotional information.

There are at least two limitations to the research presented here. First, our decision to "standardize" the emotional events that people were tested on may have decreased the personal relevance of the experience to some unknown degree and to a degree that differed across participants. In other words, the event did not draw on the personal pasts of our participants, and although the tape-recorded interview was an emotionally moving one, we cannot guarantee that it aroused the emotions of all our participants. We therefore cannot be certain that avoidant individuals would not use vigorous postemptive defensive strategies if we touched them emotionally in a content domain in which they felt vulnerable. Another limitation of the present studies is that we did not attempt to differentiate the role of implicit and explicit memory processes. As discussed above, these processes may have different implications for the way defenses are conceptualized. Research that teases these two processes apart will further advance our understanding of attachment, emotion, and memory.

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