



Attachment-Related Biases in Adolescents' Memory

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Attachment theorists propose that individuals' *internal working models* influence their social information processing. This study explored links between attachment representations and social information processing by examining adolescents' ($n = 189$; $M_{\text{age}} = 16.5$ years) attachment-related memory biases. Participants completed laboratory tasks assessing memory for (a) emotionally salient childhood events, (b) adjectives describing their parents, and (c) generalized parent-related characteristics not specific to their own parents. As expected, dismissing attachment (assessed using the Adult Attachment Interview) was linked across tasks to a deactivating strategy in which memory for emotional childhood events and attachment-relevant stimuli was reduced. In contrast, evidence that preoccupied attachment was linked to a hyperactivating strategy in which memory was heightened emerged only in relation to emotional childhood events.

In recent years, researchers from many areas of psychology (e.g., social, developmental, clinical, forensic) have shown great interest in understanding individuals' memory for emotionally salient events and information. This increased attention is likely due to the far-reaching implications and important practical applications of findings from this line of research (see Quas & Fivush, 2009, for a review). For example, understanding how people store emotionally relevant information in memory (such as information related to stressful, emotionally intense, or traumatic life events) and recall such information has important implications both for clinicians treating clients diagnosed with memory-related psychological disorders (e.g., posttraumatic stress disorder; Sutherland & Bryant, 2007) and for forensic psychologists and other persons in the legal system attempting to determine the veracity of eyewitness testimony (e.g., judges and lawyers; for reviews, see Castelli et al., 2006; Loftus, 1996). Considering these important implications, further investigation into

social-cognitive processes that bias and shape individuals' memory for emotional events and information is warranted.

Conceptualizations of memory as an active, rather than passive, process (e.g., Loftus, 1995) suggest that memories are created when people use existing social-cognitive structures (e.g., schemas or mental representations)—as well as external social information—to interpret and encode information about new experiences. Furthermore, because individuals are believed to differ in their schemas and mental representations, this perspective predicts that individuals store events and information in memory differently as a function of these mental structures. Thus, a key goal of research in this area is to advance understanding of sources of individual differences in how people process and remember emotional events and information (Quas & Fivush, 2009). Given the evidence that parent-child relationships contribute in important ways to how individuals respond to emotional and stressful experiences (Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1969/1982; Cassidy, 1994; Thompson & Meyer, 2007), as well as substantial empirical evidence for attachment-related biases in social information processing (see Dykas & Cassidy, 2011, for

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a review), attachment theory has emerged as a powerful framework within which to study individual differences in memory for emotional information (Alexander, Quas, & Goodman, 2002; Chae, Ogle, & Goodman, 2009; Dykas & Cassidy, 2011).

A central tenet of attachment theory is that humans develop experience-based mental representations (i.e., internal working models [IWMs]) of attachment through repeated daily experiences with caregivers (Bowlby, 1969/1982, 1973; Bretherton & Munholland, 2008). These IWMs are thought to contribute to the manner in which individuals process a wide array of attachment-relevant social information, most notably by affecting the ways in which individuals attend to, store, and retrieve events or information that contain explicit or implicit attachment-related elements (see Dykas & Cassidy, 2011, for a review; see also Bowlby, 1980; Main, Kaplan, & Cassidy, 1985). Links between attachment and social information processing in general, and memory in particular, are thought to reflect a broad tendency for humans to process information in ways that reflect and serve to maintain existing cognitive structures (Markus, 1980; Rumelhart, 1980).

Belsky, Spritz, and Crnic's (1996) pioneering experimental examination of Bowlby's propositions about information processing supported the expected links between attachment and memory, and spurred additional theorizing and research. To date, the vast majority of this work has examined attachment-memory links using self-reported attachment styles (i.e., the prototypical patterns of attachment-related expectations, needs, and behaviors individuals might exhibit in the context of close adult relationships; see Fraley & Shaver, 2000; see also Shaver & Mikulincer, 2002). Overall, current conceptual models of these links (cf. Dykas & Cassidy, 2011; Mikulincer, Shaver, Cassidy, & Berant, 2009) suggest that individuals possessing secure IWMs process attachment-relevant experiences and information in a relatively open and flexible manner and, therefore, are better able to accurately encode and recall the event or information. In contrast, individuals possessing insecure IWMs use different defensive mental strategies to process such information. Use of defensive strategies, in turn, is theorized to contribute to biased memory patterns (see Bowlby, 1980). The *insecure-dismissing* (or *insecure-avoidant*) dimension is characterized by the use of a *deactivating strategy* in which attachment-related information is not attended to or is suppressed in an attempt to minimize activation of the attachment system (Hesse, 1999, 2008; Main, 1990; Mikulincer

& Shaver, 2007). The *insecure-preoccupied* (or *insecure-anxious*) dimension, on the other hand, is characterized by the use of a *hyperactivating strategy*, with heightened, diffuse emotionality; exaggeration of and preoccupation with attachment-related needs; and hypervigilance to and memory for emotional information (Cassidy & Berlin, 1994; Fraley, Niedenthal, Marks, Brumbaugh, & Vicary, 2006; Hesse, 1999, 2008; Main, 1990; Mikulincer & Shaver, 2007). These two contrasting, yet not mutually exclusive, strategic patterns of insecure deactivation and insecure hyperactivation are conceptualized as orthogonal dimensions (Mikulincer & Shaver, 2007). Some insecure people may use one strategy in preference to another, and some insecure people may use both.

In this investigation, we aimed to further existing knowledge of attachment-related biases in memory by focusing on the adolescent developmental period and using the Adult Attachment Interview (AAI; George, Kaplan, & Main, 1984, 1985, 1996) to tap adolescent attachment. Our focus on adolescence is based on both traditional and contemporary theory that adolescents undergo significant cognitive growth and restructuring during which new abilities to integrate multiple levels of cognition from multiple sources emerge (e.g., the capacity for formal operational thinking is acquired during adolescence; see Piaget, 1972; see also Keating, 2004, for a review of current research on adolescent cognitive development). From an attachment perspective, adolescence is also marked by a significant social-cognitive achievement in which individuals' separate mental representations of specific parents (and other attachment figures) are consolidated into a single overarching attachment representation (i.e., a *state of mind with respect to attachment*; Main et al., 1985). An individual's state of mind with respect to attachment is inferred from the organization and quality of discourse in response to a series of questions in the AAI about attachment-related events in childhood (see Hesse, 2008). Although much data indicate that social information processing can contribute to adolescents' social functioning in important ways (see Crick & Dodge, 1994), little research has examined how adolescents' attachment representations are linked to individual differences in social information processing (see Dykas & Cassidy, 2007, 2011, for reviews).

Moreover, a new methodology has been established allowing researchers to examine AAI responses from a continuous, rather than categorical, perspective (e.g., Roisman, Fraley, & Belsky, 2007). More specifically, Haydon, Roisman, and

Burt (2012) presented converging empirical evidence that AAI responses can now be quantified continuously along *dismissing* and *preoccupied* dimensions. Use of dimensions now permits robust testing of hypotheses about both deactivating and hyperactivating attachment strategies in relation to memory processes. Findings from several studies have indicated that the use of the AAI dimensions yields support for a variety of theoretically based hypotheses. Bernier and her colleagues found that the underlying, and somewhat orthogonal, dismissing and preoccupied dimensions could be extracted from the AAI scales used to categorize interviewee state of mind with respect to attachment so as to examine adolescents' functioning in the transition from high school to college (Bernier, Larose, Boivin, & Soucy, 2004; Larose & Bernier, 2001; Larose, Bernier, & Soucy, 2005). With regard to correlates, Whipple, Bernier, and Mageau (2011) reported that the dismissing dimension was inversely related to parental sensitivity and the preoccupied dimension was inversely related to autonomy support. Haydon, Roisman, Marks, and Fraley (2011)—examining the latent structure of the AAI in relation to the Kobak (1993) Q-Sort AAI coding system—also reported that higher scores on the dismissing dimension were linked to faster reaction times in response to words suggesting proximity to an attachment figure, and higher preoccupied dimension scores were linked to higher levels of negative self-appraisals. Two studies examining interpersonal interactions revealed that the dismissing dimension was inversely related to observed positive engagement and the preoccupied dimension was linked to observed activation of negative affect (see Fortuna, Roisman, Haydon, Groh, & Holland, 2011, for interactions with siblings; Haydon et al., 2012, for interactions with romantic partners). Finally, Tarabulsky et al. (2012) reported longitudinal evidence that the AAI dimensions were linked with self-reports of adolescents' later romantic relationships in adulthood (i.e., the preoccupied dimension was associated with greater emotional arousal).

Overall, these results are particularly consistent with the idea that dismissing dimension reflects a deactivating attachment strategy, whereas the preoccupied dimension reflects a hyperactivating strategy of attachment. Although these AAI dimension scores have not yet been used to examine attachment-related differences in memory (and only once to examine social information processing more generally; Haydon et al., 2011), the reviewed studies indicate that these dimension scores are linked to the perceptions individuals generate of their social

relationships (e.g., Tarabulsky et al., 2012). For example, individuals high on the dismissing dimension tend to dismiss the importance of attachment and could deactivate attachment-related memory processes or turn attention away from attachment-related stimuli in ways that interfere with memory. In contrast, individuals high on the preoccupied dimension could manifest heightened memory for such information. Also, of important note, the dismissing and preoccupied dimensions of the AAI appear to be rather robust, regardless of whether the unresolved scales are included in their calculation. Some researchers include one or both of these unresolved scales (e.g., Roisman, Fraley, et al., 2007; Whipple et al., 2011), whereas others do not (e.g., Fortuna et al., 2011; Haydon et al., 2011).

Given the present focus on links between attachment and memory, it is also important to note that the AAI is not in itself a measure of memory. Although formulating responses to AAI questions may evoke the recall of childhood memories, AAI responses are not coded in terms of memory, but rather in terms of the qualities of the interviewee's discourse (Hesse, 2008). For example, the insistence on lack of recall AAI subscale is conceptualized as a measure of the interviewee's willingness to cognitively explore and openly discuss childhood memories, rather than a test of memory accessibility per se. As Hesse noted, "This scale [insistence on lack of memory for childhood] assesses the speaker's insistence upon the inability to recall his or her childhood, especially as this insistence is used to block further queries or discourse" (p. 565). In fact, empirical studies have provided substantial evidence that the AAI is not a measure of memory. Bakermans-Kranenburg and van IJzendoorn (1993), for example, reported that the AAI categories were independent of non-attachment-related autobiographical memory; Sagi et al. (1994) reported similar evidence that the AAI was not linked to a broad range of memory tests.

Previous studies examining attachment-related deactivating and hyperactivating strategies to memory, all using self-report attachment style measures, have focused on two aspects of memory: memory for autobiographical events and memory for attachment-related stimuli. Within the framework of attachment as an organizational construct wherein an underlying attachment organization can be manifest in multiple ways (cf. Belsky & Cassidy, 1994; Sroufe & Waters, 1977), it is not surprising that attachment biases have been linked to a variety of memory processes that stem from different

memory components (i.e., autobiographical memory is considered distinct from working memory in which stimuli are temporarily stored). In the sections below, we review previous studies examining attachment-related biases in memory and present the resulting hypotheses guiding this study.

Memory for Autobiographical Events

Previous Research

In an early study, Mikulincer and Orbach (1995) asked adult participants to recall different emotional events from childhood. Consistent with a deactivating strategy in which memory for emotional events of childhood is minimized, participants classified as avoidant on a self-report attachment style measure had difficulty recalling such events (i.e., they took the greatest amount of time to recall emotional memories and reported events that occurred at older ages) and seemed to dismiss the impact of negative events (i.e., they reported the least intense emotions associated with negative events). In contrast, consistent with a hyperactivating strategy, participants classified as anxious-ambivalent showed the fastest recall of childhood emotional events, reported events occurring at younger ages, and reported the most intense negative emotional responses. Furthermore, these individuals reported the most diffuse negative emotionality, reporting greater intensity across a range of negative emotions in response to a negative event (e.g., anger when reporting a sad event). Other studies that have asked adults to recall events from childhood (Haggerty, Siefert, & Weinberger, 2010) and memories of childhood sexual abuse (Edelstein et al., 2005) have also found evidence of memory deactivation in adults scoring higher on attachment avoidance; however, in contrast to Mikulincer and Orbach's work, the expected association between attachment and hyperactivation in autobiographical memory has not emerged (e.g., Edelstein et al., 2005, found no association between attachment anxiety and autobiographical memories of childhood sexual abuse, and Haggerty et al., 2010, reported that attachment anxiety was negatively associated with the affective intensity of recalled memories).

Additional compelling evidence that both deactivating and hyperactivating strategies bias autobiographical memories of emotional experiences comes from a daily diary study comparing participants' memory-based global reports of emotional experiences with their immediate perceptions of

emotional experiences within their daily interactions (Pietromonaco & Barrett, 1997). For dismissing participants, memory-based reports were characterized by a deactivation of the emotional responses present in their daily reports (e.g., compared to other insecure participants, dismissing participants provided memories of less intense emotions, less distress, and more denial of distress; in their immediate reports of daily interactions, however, dismissing participants reported emotions that were just as intense as those reported by participants in the other insecure groups). A different pattern emerged for preoccupied individuals, whose memory-based reports were characterized by a heightened emotionality that was not present in their daily reports. When reporting their memories of their interaction patterns, preoccupied participants reported the highest levels of emotionality, distress, and emotional intensity compared to participants in other attachment style groups; in their immediate reports of daily interactions, however, preoccupied participants did not report more intense emotions in daily interactions.

The Present Study

To examine whether adolescents' dismissive and preoccupied AAI dimension scores are linked to deactivating or hyperactivating biases in memory for childhood emotional events, we used the Mikulincer and Orbach (1995) laboratory task. On the basis of previous findings, we hypothesized that higher dismissing dimension scores would be linked to longer latencies to recall emotionally significant childhood event memories, memories of lower emotional intensity associated with these events, and memories of events that occurred at older ages. In contrast, we hypothesized that AAI preoccupied dimension scores would be linked to faster access to memories (i.e., shorter latencies), memories of high emotional intensity, and memories of events that occurred at younger ages. Further conceptual underpinnings of the age-related hypothesis relate to observations that the early years are the time when attachment behavior is particularly likely to be manifested (Bowlby, 1969/1982). Given the unique salience of attachment needs at younger ages, memories of this period may be especially vulnerable to attachment-related defensive strategies of heightened or reduced recall, with strategies of deactivation associated with reduced access to memories of younger ages, and strategies of hyperactivation associated with increased access to memories of younger ages.

Memory for Attachment-Relevant Stimuli

Previous Research

Several studies have examined links between self-reported attachment styles and memory for attachment-relevant stimuli. Collectively, these studies have yielded strong empirical support for the association between attachment avoidance and the use of a deactivating strategy. For example, in a series of four studies, Fraley and colleagues (Fraley & Brumbaugh, 2007, Studies 1 and 2; Fraley, Garner, & Shaver, 2000, Studies 1 and 2) found that individuals scoring higher on attachment avoidance showed greater deficits in recalling information from a tape-recorded interview of a woman discussing attachment-related themes. Similarly, using an experimental word-list paradigm, Edelstein (2006) reported a link between attachment avoidance and working memory deficits for attachment-related information; no link emerged for non-attachment-relevant information. Interestingly, Edelstein did not report a link between self-reported attachment anxiety and memory for attachment-relevant information, possibly, as Edelstein noted, due to the nature of the memory stimuli.

The Present Study

We assessed adolescents' memory for two types of attachment-relevant stimuli: memory for positive and negative adjectives describing adolescents' own parents and memory for generalized parent-related positive and negative emotional characteristics not specific to adolescents' own parents. We targeted memory for parent-relevant information because parents are typically adolescents' principal attachment figures and this type of information may be the most central component of adolescents' attachment-relevant memory. Although attachment has been linked to memory for specific interactions with adolescents' own parents (Dykas, Woodhouse, Ehrlich, & Cassidy, 2010; Feeney & Cassidy, 2003), it remains unknown whether attachment is linked to memory for more generalized information about parents who are not specified as the adolescents' own parents. Our hypotheses for both forms of attachment-relevant stimuli (own and generalized parents) were similar. We expected that higher AAI dismissing dimension scores would be linked to poorer memory for both positive and negative adjectives describing parents. Such a memory pattern would allow individuals high in dismissing attachment to avoid processing attachment-related information altogether, thereby

deactivating the attachment system. On the other hand, we expected that higher AAI preoccupation dimension scores would be associated with better memory for both positive and negative parent-related information. Such a memory pattern would be consistent with a hyperactivating strategy in which attachment-related information is maximized.

Method

Participants

Participants were 189 eleventh-grade students (118 girls; age in years: $M = 16.5$, $SD = .58$) who were enrolled in a larger study of adolescent social development. All participants were recruited from seven public suburban high schools in a large metropolitan area. Because the larger study focused on adolescents' relationships with both mother and father, and employed many interview and observational measures, we recruited only participants living in English-speaking, two-parent families (95% of the families annual household incomes were $> \$41,000$). The ethnic/racial makeup of this sample was White/Caucasian (73%), Black/African American (14%), Asian (10%), and Hispanic (3%). Adolescents were paid \$125 for their participation in the larger study.

Measures

Adult Attachment Interview (George et al., 1984, 1985, 1996)

We used this well-known semistructured interview to assess adolescents' current state of mind with respect to attachment. During the 1-hr interview, adolescents were asked a series of questions focused principally on attachment-related experiences during childhood. For example, the adolescents were asked to provide general descriptions of their relationships with caregivers during childhood and to recall specific experiences that supported those descriptions (see Hesse, 1999, 2008, for a detailed description of the AAI protocol and a summary of its psychometric properties). We made minor modifications to this interview to make some of the questions more appropriate for an adolescent population. Interviews were audio taped and transcribed verbatim for coding. Although the AAI was originally developed to assess attachment representations in adults, a great deal of research indicates that the AAI is also a reliable and valid measure of

attachment in adolescents (see Allen, 2008, for a review).

Using Main and Goldwyn's (1998) rating system, four trained and reliable coders—who were blind to all information about the adolescents—rated transcripts on a series of 9-point scales that represented each adolescent's probable attachment-related experiences and current state of mind with respect to attachment. Following Roisman, Fraley, et al.'s (2007) dimensional approach to the AAI, as well as subsequent research by Whipple et al. (2011), we used these scale scores to create dismissing and preoccupied dimensions of the AAI. First, for the dismissing dimension, Roisman, Fraley, et al. reported that scores could be calculated by averaging the idealization of mother ($M = 2.77$, range = 1–7), idealization of father ($M = 2.37$, range = 1–8), insistence on lack of recall ($M = 1.96$, range = 1–9), metacognitive monitoring (reverse coded; $M = 8.57$, range = 4–9), coherence of mind (reverse coded; $M = 4.50$, range = 1–9), and coherence of transcript (reverse coded; $M = 4.50$, range = 1–9) state of mind scales. Prior to creating AAI dimension scores, we examined the interrater reliability of the AAI scale scores constituting them, as well as the correlations among these subscales (see Table 1 for the correlations). In this investigation, interrater reliability among the four coders was assessed continuously throughout the coding period based on a randomly selected 29% of cases ($n = 55$) that were coded by at least two coders. In our investigation, satisfactory interrater reliability (i.e., assessed using intraclass correlation coefficients [ICCs]) emerged for all six of the scales included in the dismissing dimension (ICCs = .62 for idealization of mother, .71 for idealization of father, .86 for lack of recall, .53 for metacognitive monitoring, .68 for coherence of mind, and .70 for coherence of transcript).

Second, for the preoccupied/unresolved dimension, Roisman, Fraley, et al. (2007) reported that scores could be calculated by averaging the anger toward mother, anger toward father, passivity, unresolved loss, unresolved abuse, fear of loss, and overall derogation of attachment scales. Several factors, however, led us not to include all these dimensions. We excluded the overall derogation scale for conceptual reasons. As Roisman, Fraley, et al. noted, the finding that the overall derogation scale loaded onto the preoccupied/unresolved dimension is unexpected and counterintuitive given that a high score on this subscale is one of the hallmarks of a dismissing state of mind in the Main and Goldwyn (1998) coding system. Following Whipple et al. (2011), who indicated that the fear of loss,

unresolved abuse, and overall derogation scales could be eliminated from the average when low frequencies emerge, we excluded the fear of loss and unresolved abuse state of mind scales because we too observed very low frequencies on these two scales. In our investigation, satisfactory interrater reliability emerged for anger toward mother (ICC = .82), anger toward father (ICC = .87), and passivity (ICC = .51) scales; however, although interrater reliability in coding the AAI at the level of four categories (secure, dismissing, preoccupied, unresolved) was satisfactory ($\kappa = .61$), the unresolved loss scale showed insufficient reliability (i.e., ICC < .30) and was excluded for that reason. Therefore, we calculated a preoccupied dimension score (not including any AAI unresolved-related state of mind scores) by averaging the anger toward mother ($M = 1.32$, range = 1–6), anger toward father ($M = 1.26$, range = 1–6), and passivity ($M = 2.19$, range = 1–7) state of mind scales. Reliability analyses of the dismissing and preoccupied dimension scores used in our analyses indicated that both the dismissing and the preoccupied scales were reliable (i.e., the calculated dismissing and preoccupied dimension scores yielded ICCs of .81 and .77, respectively). The scales constituting the two dimensions also demonstrated adequate internal consistency (dismissing, Cronbach's alpha = .88; preoccupied, Cronbach's alpha = .70). The two dimensions were also weakly correlated ($r = .26$, $p < .001$).

Memory for Childhood Experiences Task (Mikulincer & Orbach, 1995)

We used this two-part task to assess adolescents' memory for emotionally significant childhood events. During the first part of the task, adolescents were asked to think back to their childhood (before the ninth grade, approximately age 14) and to recall events associated with four emotions: happiness, sadness, anxiety, and anger. Each emotional event was probed individually (and in a random order across participants) by having an experimenter show participants an index card with the emotional word printed on it in large typeface. Adolescents were instructed to press a buzzer as soon as an associated event came to mind, to state their age at the time of the event, and to briefly describe the experience. For each emotional event, the experimenter (with the participants' knowledge) recorded the amount of time (i.e., retrieval time) it took adolescents to recall the event, which was measured as the amount of time it took adolescents to press the

Table 1
Correlations Among the Adult Attachment Interview (AAI) Scale Scores

AAI scale	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Idealization of mother	—	.78**	.60**	-.09	-.69**	-.69**	.02	.05	.12	.07	.11		-.01
2. Idealization of father		—	.57**	-.14	-.65**	-.65**	.07	.12	.14	.06	.10		.10
3. Insistence of lack of recall			—	-.03	-.57**	-.56**	-.06	-.07	.10	-.01	-.13		-.03
4. Metacognitive monitoring				—	.11	.11	.13	.00	.04	-.05	-.20		-.11
5. Coherence of mind					—	.99**	-.30**	-.21**	-.46**	-.11	-.09		-.28**
6. Coherence of transcript						—	-.30**	-.22**	-.46**	-.10	-.09		-.28**
7. Anger toward mother							—	.65**	.44**	.11	.06		.38**
8. Anger toward father								—	.35**	.03	-.06		.21**
9. Passivity									—	.19*	.41*		.18*
10. Unresolved loss										—	.34*		.09
11. Unresolved abuse											—		.13
12. Fear of loss												—	
13. Overall derogation													—

Note. Correlations could not be computed for the fear of loss scale because it contained only a constant value (1).

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

buzzer after seeing the index card. For each emotion, adolescents were given 5 min to recall a childhood event; when adolescents could not recall an event, an experimenter presented the next card (adolescents failed to recall childhood events in only 1% of the cases).

During the second part of the task (i.e., after all four emotional events had been recalled and described), an experimenter instructed adolescents to picture each of the four emotional childhood event memories in their mind and to remember as vividly as possible how they felt during each event. Then, using a 6-point Likert-type scale ranging from 1 (*not at all*) to 6 (*very much*), adolescents rated the extent to which they felt the 10 emotions used in the Mikulincer and Orbach (1995) task during the event: angry, sad, embarrassed, fearful, anxious, disgusted, ashamed, depressed, surprised, and happy. (The *surprise* item was subsequently dropped because this study focused on emotions with a clear positive/negative emotional valence.) Adolescents rated the emotions separately for each emotional event; the order in which adolescents provided ratings for the happy, sad, anxious, and angry events was randomized across the sample (and could have differed from the order in which adolescents initially recalled the four emotional events). For this study, we were interested in the reported overall intensity of the four dominant emotions recalled in the emotional events (e.g., the amount of reported happiness felt during the happy event, the amount of reported sadness felt during the sad event). In addition, because of previous indications that a hyperactivating strategy involves

heightened and diffuse negative emotionality (e.g., Mikulincer & Orbach, 1995; Mikulincer & Shaver, 2007), we were also interested in the overall reported intensity of the nondominant emotions experienced during the three negative events (e.g., the amount of anger felt during the sad event).

Levels-of-Processing (LOP) Task (Rudolph, Hammen, & Burge, 1995)

We used this incidental recall task, which Rudolph et al. based on the depth-of-processing paradigm (Craik & Lockhart, 1972), to assess adolescents' *memory for positive and negative mother- and father-related words*. In this task, adolescents viewed a random assortment of 22 positive and 22 negative parent-relevant trait adjectives (e.g., supporting, accepting; insensitive, controlling), presented one at a time. Adolescents completed this task twice, once in relation to mother and once in relation to father. Half of the positive and half of the negative adjectives were typed in lowercase; the other half of these adjectives was typed in uppercase. An experimenter instructed adolescents to encode the adjectives under one of two sets of instructions (by replying either *yes* or *no*), with each set of instructions being applied to half of the 44 adjectives. Under one set of instructions, adolescents were required to encode the parent-referent properties of the adjective ("Does this word describe your mother/father?"). Under the other set of instructions, adolescents were required to encode the structural-referent properties of the adjective ("Is this word in capital letters?"). Thus, each adjective

fell into one of two groups containing 11 words: positive parent referent, negative parent referent, positive structural referent, and negative structural referent. After viewing the final adjective, adolescents were asked to recall as many viewed adjectives as possible. Using several experimental schedules and randomization schemes, we protected against experimental carryover effects, word effects for mother and father, order effects of the words, and instruction effects. For each parent, we followed Rudolph et al.'s (1995) procedure to create two summary scores. First, we created a memory for positive parent-related words score by dividing the number of yes-rated positive parent-referent words recalled by the number of positive parent-referent adjectives they rated yes. Likewise, we created a memory for negative parent-related words score by dividing the number of yes-rated negative parent-referent words recalled by the number of negative parent-referent adjectives they rated yes.

Parent–Child Story Task—Modified (Rudolph et al., 1995)

We used this task to assess adolescents' *memory for generalized parent-related positive and negative emotional characteristics not specific to adolescents' own parents* presented in the context of a secure base narrative. Unlike the LOP Task—which was aimed at assessing adolescents' memory for information related specifically to adolescents' own parents—the Parent–Child Story Task was aimed at assessing adolescents' memory for information related to nonspecific parental figures. In this task, adolescents listened to two 3-min audio-taped stories (spoken in a female voice) about an adolescent's typical day, spent in one story with the mother and in the other story with the father; the gender of the adolescent protagonist was not specified. The stories used in this investigation were modified from Rudolph et al.'s (1995) original stories to make them more appropriate for an adolescent population. For instance, in one story, the narrator describes a teenager waking up in the morning and being driven to school by the parent; in the other story, the narrator describes a teenager setting the dinner table and talking with the parent about television use (stories are available from the first author). Interspersed within the context of each story were nine positive parental attributes (e.g., thoughtful, concerned, loving) and nine negative parental attributes (e.g., mean, angry, unreliable). The adolescents were given no instructions before the recording started other than to listen to the

story about a teenager and a mom/dad. To protect against carryover effects in this task, we counterbalanced the order in which the two stories were presented (i.e., each story was presented first to half of the sample). The parent presented in each story was also counterbalanced so that the mother and father characters were presented equally in each story across the sample.

After listening to each story, the participants were asked to recall as many of the adjectives describing the hypothetical parent as possible. For both the mother and father versions of this task, adolescents received two scores: one for the total number of positive adjectives recalled from the story, and one for the total number of negative adjectives recalled (possible range for each score = 0–9). Responses were considered to indicate recall if they were either (a) the exact word provided in the story, (b) an alternative form of the adjective (e.g., *helping* instead of *helpful*), (c) a phrase associated with the adjective found in the story (e.g., for the adjective *loving*; *kissed me good-night*), or (d) a synonym of the adjective (e.g., *mad* instead of *angry*).

Procedure

Data collection spanned two laboratory sessions that occurred during the summer following the adolescents' completion of the 11th grade. During the first laboratory session, adolescents completed (in this order) the Memory for Childhood Experiences Task, the Story Task, and the LOP Task. Of note, due to laboratory time constraints, the father-related version of the LOP Task was not included in the battery of measures administered to the first 135 adolescent participants; thus, in this investigation, we only examined the LOP Task data from the 54 participants who completed this task in relation to both mother and father. (Missing data for all other memory measures were minimal and are reflected in the relatively large analysis sample sizes reported in the next section.) In the second laboratory session, approximately 1 month later, adolescents completed the AAI. (Scheduling difficulties prohibited one adolescent from completing the AAI.)

Results

Descriptive Statistics and Exploratory Data Reduction

We present descriptive statistics for the core study variables in Table 2. This study incorporated a variety of memory tasks, and we decided to

Table 2
Descriptive Statistics for the Study Variables

Task/variable	N	M	SD	Range
Adult Attachment Interview				
Dismissing dimension	188	4.13	1.33	2.00–8.00
Preoccupied dimension	187	1.59	0.83	1.00–5.17
Childhood Emotional Experiences Task				
Recall time anxious memory	170	7.66	8.91	0.62–60.00
Recall time happy memory	173	6.88	7.69	0.15–48.00
Recall time sad memory	173	6.81	8.58	0.59–66.00
Recall time angry memory	172	10.94	14.48	0.01–110.00
Recalled intensity of anxious memory	171	5.44	0.79	3.00–6.00
Recalled intensity of happy memory	174	5.72	0.77	1.00–6.00
Recalled intensity of sad memory	173	5.57	0.82	1.00–6.00
Recalled intensity of angry memory	172	5.57	0.92	1.00–6.00
Story Task words recalled				
Positive mother-related words	187	2.99	1.64	0.00–8.00
Positive father-related words	187	3.67	1.50	0.00–8.00
Negative mother-related words	187	2.94	1.63	0.00–8.00
Negative father-related words	187	3.58	1.67	0.00–7.00
Levels-of-Processing Task words recalled				
Positive mother-related words	189	0.32	0.13	0.08–1.00
Positive father-related words	54	0.32	0.15	0.08–0.80
Negative mother-related words	189	0.54	0.30	0.11–1.00
Negative father-related words	54	0.51	0.29	0.14–1.00

examine whether the memory tasks could be statistically related and reduced due to similar scoring procedures (i.e., whether scores from these tasks could be reduced into a singular factor in a principal components factor analysis). We could not include scores from the Emotional Memory Task in this factor analysis because this task yielded complex repeated measures data that could not be coherently analyzed with the basic negative and positive summary scores generated by the LOP Task and the Story Task (i.e., the Emotional Memory Task variables are dependent on one another and are not independent scores, like those yielded by the Story Task and LOP Task). Thus, we submitted scores from both the LOP Task and the Story Task to principal components factor analyses. We conducted separate analyses for the number of positive words recalled and for the number of negative words recalled in the mother- and father-related versions of these tasks. None of the four factor analyses yielded evidence that the scores obtained in the LOP Task and Story Task—for

mothers or fathers—could be reduced into a singular factor (i.e., all eigenvalues < .18, all proportions of explained variance < 19%). As such, we analyzed scores obtained from the LOP Task and Story Task separately. In the following sections, we present our principal findings and interpret the significance of attachment-related effects (i.e., *p* values for only the dismissive and preoccupied dimension scores) using the conventional *p* < .05 testing benchmark.

Principal Analyses

Attachment and Memory for Emotionally Significant Childhood Events

Using SAS/STAT® 9.1 software (i.e., PROC Mixed) to examine complex statistical models incorporating both random and fixed effects, we conducted four repeated measures analyses of variance (ANOVAs) to examine whether attachment was linked to: (a) the amount of time it took adolescents to retrieve memories of the four probed emotional events, (b) the age at which participants reported that the events had taken place, (c) the recalled intensity of the dominant emotions during the events, and (d) the recalled intensity of the non-dominant negative emotions during the negative events. Thus, in the four analyses, the random effect (the repeated factor) was either adolescents' memory retrieval times for the four recalled emotional events, the participants' reported age during the event, the reported intensity of the four dominant emotions (reverse scoring participants' degree of happiness to make this score congruent with the other three), or the reported intensity of the non-dominant emotions. The fixed factors in these analyses were memory type (four levels: happy memory vs. sad memory vs. anxious memory vs. angry memory) and adolescents' continuous AAI dismissing and preoccupied dimension scores. In addition to testing all main effects, we tested all first-order and second-order interactions between these effects.

As can be seen in Table 3, with respect to recall times, a significant main effect emerged for the AAI dismissing dimension score: Higher adolescent dismissing scores were linked to longer amounts of time adolescents needed to recall emotional childhood memories ($b = 1.44$, $SE = .38$). The main effect for the AAI preoccupied dimension score was not significant. With respect to the reported age at which the emotional events took place, significant main effects emerged for both AAI dimension scores: Higher adolescent dismissing scores were

Table 3

Summary of Mixed Model Analyses for Memory for Childhood Emotional Experiences Task

	Memory for Childhood Emotional Experiences Task							
	Recall time		Age		Dominant emotional intensity		Nondominant emotional intensity	
	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>
Emotion	0.28 ^a	.84	1.40 ^c	.24	82.59 ^e	< .0001	2.24 ^e	.11
Dismissing dimension	14.74 ^b	.0002	5.27 ^d	.02	1.99 ^f	.16	0.30 ^e	.58
Preoccupied dimension	0.52 ^b	.47	5.98 ^d	.02	0.11 ^f	.74	3.86 ^e	.05
Emotion × Dismissing Dimension	0.22 ^a	.88	0.55 ^c	.65	0.80 ^e	.49	2.49 ^e	.08
Emotion × Preoccupied Dimension	1.39 ^a	.25	2.36 ^c	.07	0.58 ^e	.63	2.08 ^e	.13

^a*df* = 500. ^b*df* = 168. ^c*df* = 486. ^d*df* = 165. ^e*df* = 501. ^f*df* = 169.

linked to older reported ages during which the events occurred ($b = .34$, $SE = .15$), whereas higher adolescent preoccupied scores were linked to younger reported ages during which the events occurred ($b = -.59$, $SE = .24$). With respect to the reported intensity of dominant emotions, no significant attachment-related results emerged, even though participants were more likely to report greater dominant anger ($M = 5.41$, $SE = .06$), sadness ($M = 5.56$, $SE = .06$), and anxiety ($M = 5.44$, $SE = .06$) than happiness ($M = 1.27$, $SE = .06$; all $ps < .05$). With respect to the reported intensity of nondominant emotions, a significant main effect for adolescents' preoccupied scores emerged, such that higher scores were linked to more intense nondominant emotions ($b = .11$, $SE = .05$). The main effect for the AAI dismissing dimension score was not significant. No significant interactions among main effects emerged.

Attachment and Memory for Positive and Negative Own Mother- and Own Father-Related Adjectives

Using a pair of repeated measures analyses similar to those described above (including the analysis of main effects and interactions), we examined whether attachment was linked to adolescents' memory for positive and negative parent-related adjectives presented in the LOP Task. In one analysis, the repeated factor was the number of positive words recalled; in the other analysis, the repeated factor was the number of negative words recalled. The fixed factors in both of these analyses were the parent presented in the task (i.e., parent; two levels: mother vs. father) and adolescents' continuous AAI dismissing and preoccupied dimension scores. As

can be seen in Table 4, with respect to negative parent-related words recalled, higher dismissing scores (but not preoccupied scores) were linked to fewer recalled negative parent-related adjectives ($b = -.04$, $SE = .02$). Attachment was not linked to adolescents' memory for positive parent-related words, and no interactions emerged in these analyses.

Attachment and Memory for Generalized Parent-Related Positive and Negative Emotional Characteristics Not Specific to Adolescents' Own Parents

In the final set of analyses, we used the same statistical model used to examine adolescents' memory for mother- and father-related words in the LOP Task. As can be seen in Table 4, higher adolescent dismissing scores (but not preoccupied scores) were linked to fewer recalled positive generalized parent-related adjectives ($b = -.17$, $SE = .07$). Attachment was not linked to adolescents' memory for negative generalized parent-related adjectives, although adolescents recalled fewer negative mother-related words ($M = 2.92$, $SE = .12$) than father-related words ($M = 3.58$, $SE = .12$) across the two stories. No interactions emerged in any of these analyses.

Discussion

To address important gaps in the attachment and memory literature, we examined links between adolescents' state of mind with respect to attachment (assessed using AAI dismissing and preoccupied dimension scores) and their memory biases for attachment-relevant information. Considered as a

Table 4

Summary of Mixed Model Analyses for Levels-of-Processing (LOP) Task and Story Task

	LOP Task				Story Task			
	Positive parent-related words		Negative parent-related words		Positive parent-related words		Negative parent-related words	
	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>
Parent	0.12 ^a	.73	0.04 ^c	.84	1.85 ^d	.18	3.83 ^d	.05
Dismissing dimension	1.29 ^b	.26	4.31 ^b	.04	6.89 ^e	.01	2.92 ^e	.09
Preoccupied dimension	0.90 ^b	.34	0.01 ^b	.93	0.07 ^e	.80	0.07 ^e	.79
Parent × Dismissing Dimension	0.01 ^a	.94	0.15 ^c	.70	0.83 ^d	.36	1.77 ^d	.19
Parent × Preoccupied Dimension	0.55 ^a	.46	0.82 ^c	.37	1.65 ^d	.20	1.10 ^d	.29

^a*df* = 51. ^b*df* = 184. ^c*df* = 50. ^d*df* = 181. ^e*df* = 184.

whole, a larger number of significant results emerged for the insecure-dismissing AAI dimension than for the insecure-preoccupied AAI dimension (i.e., four of eight analyses vs. two of eight analyses showed significant results). More precisely, results supported the predicted link between dismissing dimension scores and a deactivating strategy in relation to memory for childhood emotional experiences and parent-related adjectives. The expected link between preoccupied dimension scores and a hyperactivating strategy emerged only in the context of memory for childhood emotional events; as a result, overall, memory for childhood events (in particular, latency to recall such events) appeared to be most correlated with adolescents' attachment. This correlation may have occurred because the Memory for Childhood Experiences Task provides the closest parallel to the AAI. It is noteworthy that these findings are consistent with five studies in the self-reported attachment style literature that did not find significant links between attachment anxiety and memory for attachment-relevant stimuli (Edelstein, 2006; Fraley & Brumbaugh, 2007, Studies 1 and 2; Fraley et al., 2000, Studies 1 and 2). Further research will be needed to establish the reason for this discrepancy in findings across memory tasks. Below, we discuss results related to deactivating and hyperactivating strategies.

Dismissing Dimension Scores and Deactivation

Memory for Emotionally Significant Childhood Events

Consistent with our predictions, adolescents with higher scores on the dismissing dimension took longer to recall emotional events from childhood,

regardless of the type of emotional event, and reported events that occurred at older ages. Contrary to expectations, and to the findings of Mikulincer and Orbach (1995) and Haggerty et al. (2010), no significant links emerged between dismissing dimension scores and the reported emotional intensity of the recalled childhood events. These results are largely congruent with theory and empirical studies suggesting that dismissing individuals have decreased accessibility to attachment-relevant autobiographical memories (e.g., Cassidy & Kobak, 1988; Dykas & Cassidy, 2011; Edelstein et al., 2005; Hesse, 2008; Mikulincer & Orbach, 1995). It is unclear why previously reported findings on the link between dismissing attachment and reported emotional intensity of childhood events did not emerge in our study. It is possible that this inconsistent finding is due to measurement differences (both prior studies assessed attachment with self-report measures). Also, this previous work examined the memories of adults for childhood events; it is possible that attachment-related memory biases work differently in adolescents who are closer in time to the actual emotional event.

Memory for Parent-Relevant Positive and Negative Stimuli

Additional evidence that the dismissing dimension is associated with a deactivating strategy came from the finding that more dismissing adolescents had difficulties remembering new attachment-relevant information. For example, these adolescents recalled fewer negative adjectives describing their own parents. Contrary to expectation, dismissing dimension scores were not associated with adolescents' memory for positive adjectives describing

their own parents. For information specific to adolescents' own parents, it is possible that significant findings emerged only in the case of negative, but not positive, adjectives because only negative aspects of parents are sufficiently painful to lead adolescents high on dismissing attachment to engage in a deactivating strategy. In fact, the AAI coding scale, *idealization of the attachment figure*, is a key contributor to high dismissing scores; as such, adolescents high on dismissing attachment may be comfortable with positive information that is specific to their own parents and have no inclination to limit it.

A different set of findings emerged for memories of generalized parent-related emotional characteristics not specific to adolescents' own parents. Whereas for memories related to their own parents, the dismissing dimension was related to poorer memories for *negative* but not positive information, the reverse was true in this task, wherein the dismissing dimension was related to poorer memories for *positive* but not negative information. It may be that when the negative parent-related information is not specific to adolescents' own parents, the information is not viewed as threatening and, therefore, is not deactivated. These individuals may instead view *positive* generalized parent-related information as threatening and potentially pain inducing because this information reminds them of the shortcomings of their own parents and the lack of support that they themselves are likely to have received (Dykas & Cassidy, 2011; Hesse, 2008). As a result, more dismissing individuals may reduce memories of this positive information about other parents as a means of avoiding pain.

An alternative interpretation of these results is based on the notion of schema-based information processing. To the extent that information about parents who are not one's own is not painful and therefore not excluded from further processing, adolescents may process information in a schema-based manner (i.e., such that memories for events that do not fit one's experience-based schema are more easily forgotten; Dykas & Cassidy, 2011). Given that more dismissing adolescents lack an experience-based schema of loving parents (Hesse, 2008), it may be this lack of such a schema that accounts for the finding that highly dismissing adolescents have difficulty remembering positive parent-related adjectives (for reviews of studies indicating poor memory associated with schema-inconsistent information, see Schacter & Scarry, 2000; Stangor & McMillan, 1992).

Preoccupied Dimension Scores and Hyperactivation Memory for Emotionally Significant Childhood Events

Consistent with our prediction related to hyperactivation, highly preoccupied adolescents reported emotional events that occurred at younger ages and reported experiencing more intense *nondominant* emotions at the time of the event. The heightened nondominant emotions reported by more preoccupied adolescents reflect preoccupied individuals' heightened emotionality and difficulty regulating internal distress (Roisman, Tsai, & Chiang, 2004). These difficulties with emotion regulation seem to allow dominant emotions to "spill over" into nondominant emotions. This emotion dysregulation is evident in the AAI during which preoccupied individuals provide confused, angry, and excessively emotional accounts of early childhood experiences (Hesse, 1999, 2008). These findings not only match those of Mikulincer and Orbach (1995), whose Memory Task we used, but they also mesh with findings of Sutin and Gillath (2009) who similarly found high levels of a variety of negative emotions to characterize individuals high on self-reported attachment anxiety when they reported memories of an important relationship. The finding of a link between higher level of preoccupied attachment and younger age at the time of the reported event is also consistent with the results of Mikulincer and Orbach and provides evidence for a hyperactivating strategy that increases the accessibility of attachment-relevant memories. It is not clear why study results related to the latency to recall emotional events and the intensity of dominant emotions experienced at the time of the reported events did not mesh with those of Mikulincer and Orbach.

Memory for Parent-Relevant Positive and Negative Stimuli

Contrary to our expectations, no significant findings emerged for the link between the preoccupied dimension and memory for parent-relevant information, regardless of whether that information was specific to adolescents' own parents or generalized parental figures. It may be that hyperactivating strategies are manifested only in particularly salient and overtly emotional contexts involving the individual, such as in memory for emotional events of one's own childhood. Such a possibility meshes with findings that a negative emotion memory bias was evident in high-attachment-anxiety individuals, when the focus was on memory for emotion that

had occurred in a previous therapeutic session (Woodhouse & Gelso, 2008).

Study Strengths, Limitations, and Future Directions

This study was characterized by several strengths. First, most prior research on attachment-related memory biases measured attachment using self-report attachment style measures. This study is one of only a handful of studies that has investigated memory processes related to attachment measured with the AAI (e.g., Dykas, Woodhouse, Ehrlich, & Cassidy, 2012; Dykas et al., 2010), and is the first to specifically examine hyperactivating and deactivating memory biases associated with AAI attachment. Importantly, this study revealed findings that were largely consistent with those reported in studies that examined memory processes related to attachment style. Given the weak empirical association between AAI and self-reported attachment (Roisman, Holland, et al., 2007), future research should continue to explore how self-reported and AAI attachment are similarly and differently related to memory biases for a variety of types of attachment-relevant information.

A second strength of this study is the use of the two AAI attachment dimensions rather than the conventional attachment categories. Mikulincer and Orbach (1995), in their examination of memory biases related to self-reported attachment categories, commented, "Further research should attempt to replicate the current findings, using dimensional measures of attachment . . . rather than categorical ones" (p. 924). We heeded the authors' suggestion and found results that were consistent in some ways, but not others. Further research may be needed to better understand the meaning of the discrepancies between our findings with the AAI and previous findings with self-reported attachment, and thus expand on early seminal work on differential correlates of the AAI and self-reported attachment dimensions (e.g., Roisman, Holland, et al., 2007).

Additional strengths of this study are the use of an adolescent sample and the inclusion of fathers. Adolescence is an important developmental period characterized by important changes in a variety of cognitive, emotional, biological, and behavioral domains, including attachment (Allen, 2008). Despite the importance of this development period, to our knowledge, only four published studies have examined attachment-related biases in adolescents' memory for attachment-relevant social information (Dykas & Cassidy, 2011, 2012; Feeney & Cassidy, 2003, Studies 1 and 2). The inclusion of fathers is an

important advancement over much prior research, in both the attachment literature and the developmental literature more broadly, in which examination of paternal influences on development has been historically underrepresented.

A further strength of this study is that our assessment of the influence of attachment on memory for three different types of information provided a more complete examination of the ways in which attachment links to memory processes. Moreover, the use of the Story Task permitted examination of Bowlby's important idea that attachment organization guides the processing of information not only about familiar people and circumstances but also about novel people and circumstances as well (Bowlby, 1980; see also Roisman, 2006).

Despite these strengths, caution is warranted in interpreting the results in light of several study limitations that could be addressed in future research. First, the effects sizes obtained in this study are relatively small. Yet we agree with McCartney and Rosenthal (2000) that the importance of effect sizes must be viewed in terms of the developmental outcomes in question. Indeed, a small effect in one aspect of development may make incrementally important contributions to development and overall health. As such, individuals' attachment-related memory biases may be small, but over time such biases could have major implications for how the person develops, especially in the context of close personal relationships.

Second, adolescents in this study were predominantly Caucasian, 95% had households with annual incomes > \$41,000, and all came from two-parent families. It is unclear whether our results would generalize to a sample of adolescents who are more diverse in terms of ethnicity and socioeconomic status, or to adolescents raised in single-parent families.

Third, it is unclear from our study which aspects of memory (encoding, storage, retrieval) were influenced by adolescents' attachment representations to produce attachment-related memory biases. Research suggests that attachment-related processes influence each of these aspects of memory (Chae et al., 2009; Fraley & Brumbaugh, 2007; Fraley et al., 2000). Furthermore, although robust evidence emerged that increased dismissiveness was linked to biased memory for attachment-relevant information, we cannot infer from the present data whether this defensive pattern represented the suppression of attachment-related information or, alternatively, the redirection of attention away from such information. From a cognitive architecture perspective (see Fraley, Davis, & Shaver, 1998), suppression and redirection

of attention are both defensive processes that individuals could use to prevent the processing of potentially painful social information. Future research should attempt to elucidate which aspects of memory are influenced by adolescents' attachment representations.

On a related note, we also cannot be sure whether the memory differences found reflect the influence of attachment on memory processes or differences in actual childhood experiences (e.g., the finding that individuals high on the dismissing dimension took longer to recall emotional childhood experiences could reflect attachment-related differences in how memories are processed, or it could instead reflect a relatively lower number of childhood emotional experiences available for recall). It is also possible that memory characteristics contribute to attachment characteristics or to assessment of these characteristics. Finally, the link between attachment and memory could be part of more sophisticated models containing a variety of potential mediators (e.g., emotion regulation capacities) and moderators (e.g., current relational experiences). The potentially complex connections among attachment, memory, and emotion regulation warrant additional research, which could be guided by Roisman and Haydon's (2011) propositions that earned security is linked to depressogenic biases in memory, as well as Kobak and Zajac's (2011) and Dykas et al.'s (2010, 2012) proposals that current relationship dynamics may affect how attachment figures and events are perceived in retrospect.

An additional limitation relates to the use of the AAI dimension scores. Different samples with lower or higher preoccupation (or dismissing) score ranges may or may not replicate our findings. Similarly, samples with higher levels of lack of resolution with respect to abuse or loss may also yield different results. Moreover, the low number of adolescents classified into the preoccupied attachment category ($n = 10$) in our sample contributed to less variability on the preoccupied dimension relative to the dismissing dimension, and likely decreased our ability to detect some significant effects despite using the continuous indices of attachment. Further research on attachment-related memory biases in samples with higher numbers of preoccupied individuals is warranted.

Finally, results are correlational and preclude inferring causal relations between the attachment dimensions and memory for attachment-relevant information. Although our findings mesh with attachment theory and research, it is possible that

some important causal variables were not measured and included in the analyses.

In addition to the future directions described above, new studies could examine many other aspects of attachment and memory. Researchers could examine the conditions under which memory is guided by deactivating, hyperactivating, and schema-based processes. Experimental paradigms would allow examination of potential causal mechanisms. For example, priming of security (see Mikulincer & Shaver, 2007; Shaver & Mikulincer, 2002) could shed light on whether memory differs under insecure or secure priming conditions. Alternatively, inclusion of physiological activation measures, as some previous researchers have done (e.g., Dozier & Kobak, 1992; Roisman et al., 2004), could clarify the conditions under which attachment-related defensive deactivation, hyperactivation, and biased schematic processing of social information occur. Longitudinal studies, including an attachment-related intervention and a randomized controlled design, could be used to examine how developmental changes in adolescent attachment are linked to changes in memory for parents and others, as well as which aspects of memory (encoding, storage, or retrieval) are most strongly linked with attachment biases.

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