Memory for emotional experiences in the context of attachment and social interaction style

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A R T I C L E   I N F O

Important dimensions of emotional experiences include the level of arousal elicited and the source of that arousal, yet memory for events differing on these constructs is often compared within and across studies. One important factor for emotional memory is attachment security, which predicts how parents and children relate to each other and to the world around them. The present study investigated differences in 8- to 12-year olds’ recall of emotional stimuli varied in relevance to attachment themes of separation and reunion. Moreover, memory was examined as predicted by children’s attachment security, parents’ attachment avoidance and anxiety, and parental elaboration during an interaction about the laboratory experience. Results revealed that recall was best for stimuli involving separation. Moreover, recall for separation stimuli was positively predicted by children’s attachment security, parents’ attachment avoidance and anxiety, and negatively predicted by parental anxiety and elaborative interaction style. These findings highlight the importance of considering the effect of multiple dimensions of emotional events on children’s memory and how contextual factors may differentially predict those memories.

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This research was supported by grants to Rosemarie Kraft from the Agricultural Experiment Station at UC Davis. We thank the many undergraduate and graduate research assistants who made this project possible and to Dr. Robyn Fivush for insightful feedback on earlier versions of this manuscript. Special thanks go to the families who volunteered their time to participate in this study. For copies of the stimuli, contact the corresponding author.

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0885-2014/$ – see front matter © 2010 Elsevier Inc. All rights reserved.
doi:10.1016/j.cogdev.2010.08.002
Studying children’s memory for emotional experiences presents a unique challenge because of the multidimensional nature of emotion. In addition, there are limitations to which types of events can be verifiably studied. Important dimensions of emotional experiences include the level of arousal elicited and the source of that arousal, yet events differing on these constructs are often compared within and across studies. To identify which of these dimensions are crucial to understanding memory, an important undertaking for researchers is to explore recall for events systematically differing in amount and source of arousal. Specifically, whether the event evokes positive, negative, or neutral feelings, and how the event relates to children’s extant schemas of the world (e.g., attachment) may be factors that contribute to how much children recall about their experiences.

Although researchers have explored the effects of valence and arousal on children’s memory (Alexander, Goodman et al., 2002), less commonly studied is the source of the arousal—that is, whether the stimulus activates an existing schema that may affect encoding or retrieval of an emotional event. Moreover, individual differences in children’s memory for emotional events emerge from complex transactions throughout development (Alexander & O’Hara, 2009; Ayoub & Fischer, 2006). For instance, individual differences in attachment security affect the predictions, expectations, and interpretations children have for their experiences (Bowlby, 1969/1982) and thus encoding and retrieval of emotional or attachment-related experiences. Moreover, parents’ attachment profiles and manner of interacting with their children play a role in children’s recall of emotional experiences (e.g., Quas et al., 1999).

The current study was designed to investigate experimentally how characteristics of the to-be-remembered event affect recall in preadolescent children. We examined children’s recall of stimuli designed to vary in valence (positive vs. negative) and inclusion of an explicit attachment theme (high vs. low attachment relevance). Additionally, individual differences in children’s social developmental context (attachment, parental interaction style) were used to predict recall.

1. Emotional and attachment-related memory

A large body of research has pointed to the unique nature of memory for emotional events. Specifically, whether referring to an event (stories involving emotional and non-emotional behavior; Davidson, Luo, & Burden, 2001), experimental stimuli (emotional vs. neutral words; Kensinger & Corkin, 2003) or state of mind (Bishop, Dalgleish, & Yule, 2004), memory is generally increased for emotional as compared to neutral stimuli. Multiple theoretical approaches exist to explain the unique nature of emotional memories, including those regarding goal attainment (Levine & Edelstein, 2009) and the contribution of the developmental context to information processing before, during, and after the event (Alexander & O’Hara, 2009), both of which suggest that studying emotion alone is insufficient. Rather, the focus needs to be on event characteristics eliciting that emotion.

One characteristic on which emotional events vary is valence. Whether an event elicits positive or negative emotion may affect how it is encoded, maintained, and retrieved from memory. Some studies suggest the quality of recall may differ based on valence (Fivush, Hazzard, Sales, Sarfati, & Brown, 2003). Less well studied in developmental literature is the quantity of accurate recall. That is, how much correct information children are able to provide about positive and negative events is unclear. In one study examining children’s memory for personal experiences, more correct details were reported about positive (vs. negative) events (Schaaf, Alexander, & Goodman, 2008). In another study (Fivush et al., 2003), researchers asked children to recount positive and negative experiences, with results showing the number of details recalled similar for positive and negative events. Given the naturalistic environment in which these experiences occurred, however, researchers were unable to assess the accompanying arousal. In attempts to control such confounds, Thomas and Hasher (2006) used experimental stimuli to assess memory in young adults, revealing a memory advantage for negative over positive words.

The current study compares children’s memory for positive and negative stimuli matched for arousal but varied in valence. Similar to adults, we expected children’s recall of negative, as compared to positive, stimuli to be greater. Although matched in arousal, negative events may attract more attention at encoding. For example, in a study involving 11-year-old children, Perez-Edgar and Fox (2003) found response times to negative words to be significantly slower than neutral and positive words indicating more time processing negative stimuli. Kirsh and Cassidy (1997) studied preschool
children’s attention to attachment-related emotional stimuli. Although they did not conduct analyses to compare positive to negative valenced pictures, examination of the means shows a trend for children to attend more to negative than positive pictures. Additional support for this expectation comes from studies of adults’ differential ERP to viewing negative versus positive pictures (Hajcak & Dennis, 2009) and greater recognition of negative than positive or neutral pictures (Comblain, D’Argembeau, van der Linden, & Aldenhoff, 2004).

Emotional events also vary in the degree to which they activate the attachment system. The attachment system has been described as an innate system driven to organize the world according to schemas of the self and others, and the system is activated by personal threat or feelings of need for closeness to the caregiver (Bowlby, 1969/1982). Experimental stimuli that activate this system through explicit mention of separation or reunion may thus be expected to be differentially encoded, stored, and retrieved, as compared to events less likely to activate the attachment system or likely to evoke it to a lesser degree. Few studies have directly compared equally arousing high and low attachment-related stimuli. In one study, however, preschool children participated in an attachment-relevant event and an arousing event not involving an explicit attachment theme (e.g., inoculation; Alexander & Edelstein, 2001). Children recalled the high attachment-relevant event better than the low attachment-relevant event. These events differed on a number of dimensions; thus, interpretations must be made with caution.

The current study was designed to provide systematic variation in the emotional valence and presence of attachment themes. In doing so, we not only explore the effects of valence or attachment relevance on memory, but how the two might interact to predict memory. We expected stimuli high in attachment relevance to be recalled more than those low in attachment relevance, primarily because of the activation of the attachment system. Activation of this system may be associated with heightened attention and may increase likelihood of recalling attachment-related information. Moreover, because children may attend more to negative than positive stimuli, we expected high attachment-relevant negative stimuli (separation) to be recalled better than other stimuli.

2. Individual differences in attachment and memory

In addition to important characteristics of the event, how the child processes, stores, and retrieves the event is modulated by individual differences. Specifically, individual differences in the organization of children’s attachment system result from the developmental and relational history of the child. This attachment organization is activated by events high in attachment relevance and will play a role in how the events are processed (Alexander & O’Hara, 2009). This may occur through internal working models (IWMs), which are posited to be part of the attachment system and formed early in life. IWMs guide individuals’ predictions of social interactions, attributions about others’ actions and intentions, and responses to social events and interactions (Bowlby, 1969/1982). IWMs provide the representational framework from which individuals evaluate experiences, interpret novel situations, and predict potential outcomes (Bowlby, 1969/1982; Bretherton & Munholland, 1999). Because attachment relations and IWMs are bidirectionally related, individual differences in attachment security might play a unique role in children’s memory for experiences high in attachment relevance (Alexander, Quas, & Goodman, 2002).

A growing body of research has shown that children’s memory for emotional experiences is predicted by children’s attachment organization (Alexander & Edelstein, 2001; Belsky, Spritz, & Crnic, 1996; Kirsh & Cassidy, 1997; Schaaf et al., 2008), but no study to our knowledge has directly compared equally arousing high and low attachment-relevant events. For example, Belsky et al. (1996) studied preschool children’s recognition memory for emotional puppet shows, finding an interaction between children’s attachment style and puppet show valence: secure children recognized more positive puppet show representations, whereas insecure children recognized more negative puppet show representations. They did not test children’s recall, which could vary considerably from their recognition in terms of quantity of information and which stories would be more likely to be recalled freely versus recognized when presented with cues. Kirsh and Cassidy (1997) studied preschool children’s recall of pictures with attachment-relevant themes similar in nature to the high attachment-relevant stimuli in the current study. Their results showed secure children recalled more about all pictures
than insecure children. In the current study, we hypothesized that preadolescent children's attachment security would also positively predict their memory for high attachment-relevant stimuli. When stimuli are presented or brought to mind, more secure children may be better able to cope with the internal demands made by those involving attachment themes and thus may report more details about such stimuli.

Individual differences in parental attachment have also been linked to children's memory for emotional events. This is thought to be due, in part, to how the feelings and actions parents have about relationships play a role in the context in which children develop and learn about attachment relationships (Alexander & O'Hara, 2009). Self-report measures of attachment provide indicators of the degree to which adults avoid intimate relationships (i.e., avoidance; Brennan, Clark, & Shaver, 1998) or feel anxious or preoccupied by such relationships (i.e., anxiety; Brennan et al., 1998) and have been related to traditional measures of parent–child attachment (Fraley & Shaver, 2000) and caregiving behaviors (Edelstein et al., 2004). Using such measures, parental attachment avoidance and anxiety have been linked to children's memory for emotional events (Alexander, Goodman et al., 2002; Goodman, Quas, Batterman-Faunce, Riddlesberger, & Kuhn, 1997; Quas et al., 1999). For instance, Alexander, Goodman et al. (2002) found an interaction between parental avoidance and children's distress during an inoculation, such that less avoidant parents had children with a positive correlation between distress and memory, whereas more avoidant parents had children with a negative correlation between distress and memory. This result underscores questions about how individual differences in parents' attachment predict children's memory for emotional events. Because parents with different attachment profiles would be expected to create different relational contexts, we predicted parental attachment avoidance would be negatively related and attachment anxiety would be positively related to children's memory for high attachment-related stimuli.

3. Parent–child interaction as developmental context

Another important contribution to the context in which children develop is the pattern parents use to interact about past events. Parent–child interactions resulting in a greater number of opportunities to practice open communication regarding emotional events have been associated with an increase in children's emotional understanding (DeRosnay & Harris, 2002; Greig & Howe, 2001; Laible & Thompson, 1998; Ontai & Thompson, 2002). Thus, parent–child interaction style may be associated with children's long-term memory for events because of a shared history of organizing emotional events and because of qualities of their conversations about the particular experienced event (Hedrick, Haden, & Ornstein, 2009).

There are vast individual differences in the style in which parents interact with their children, and studies of preschoolers and their parents have elucidated these differences. Studies of parent–child interaction while reminiscing about shared events—events parents and children have experienced together—have generally measured the extent to which parents are elaborative, evaluative, or repetitive (see Fivush, Haden, & Reese, 2006 for review). These reminiscing studies generally show that more elaborative parents, those providing more details about the experience or asking questions requiring the child to provide new event information, have children who recall more about their experiences (Wenner, Burch, Lynch, & Bauer, 2008). Parents' elaborative style may afford young children the opportunity to co-construct their life-story narratives and rehearse emotional events, guiding children to provide more accurate recall of emotional events (Haden, Haine, & Fivush, 1997).

As children reach middle childhood, social relationships with peers and non-parental adults begin to take on greater import, and although parental elaborative style remains important, the manner in which parents and children interact changes (Peterson & McCabe, 2004; Wenner et al., 2008). One important change is the transition from communicative exchanges involving primarily shared events to those involving an increasing number of unshared events. There is a distinction between shared events about which parents reminisce with their children and unshared events about which parents engage in conversation to gather information, termed recounting by Reese and Brown (2000). Given this distinction, the pattern of parent–child communication following an unshared emotion-evoking experience may provide insight into how children have been taught to attend to and organize their
memories when the parent is unable to reinforce those details due to the nature of the unshared experience. The current study employed a measure of parental style while recounting an unshared event with preadolescent children. It is possible that when parents of preadolescents elicit more information (i.e., elaborative), the children also recall more about their experiences, which is consistent with research involving preschoolers’ reminiscing. Alternatively it is possible that during middle childhood, a transition in parent–child interaction style occurs such that parents who had an elaborative style with their young children appropriately reduce their elaborative statements and questions as these previously elaborative parents no longer need to offer such prompting for children to provide cohesive narratives. This is consistent with research concerning children’s free recall showing that accuracy remains similar across age groups, but completeness increases with age (Eisen, Goodman, Quas, & Davis, 1998). Because of the strong body of research showing an advantage for children of elaborative parents, we expected more elaborative parents to have children with better recall of the emotional stimuli, particularly those stimuli high in attachment relevance and presumably requiring the most emotion regulation.

4. The present study

The goal of the current study was to identify event characteristics important to children’s recall of emotional stimuli matched in arousal but varied in valence and attachment relevance. A second goal was to examine sources of individual difference in children’s recall for these different event characteristics. To this end, we assessed children’s attachment, parents’ attachment, and parental interaction style. First, it was hypothesized that children would recall more details about negative than positive events and high attachment-related than low attachment-related events. Second, children’s attachment security and parental attachment anxiety were expected to predict better memory, specifically for stimuli high in attachment relevance (i.e., separation, reunion), whereas the opposite was expected for parental avoidance. Third, increased parental elaborative style was hypothesized to be associated with increased memory in children.

5. Method

5.1. Participants

The sample consisted of 42 children (27 female) recruited from the community via flyers and community events. Parents were contacted via phone and those who agreed to participate visited the laboratory on two occasions, where children were tested individually. Based on parent report, children were selected to be strongly right-handed and native English speakers with no known developmental delays. Children ranged in age from 7 to 12 years (M = 9.19 years, SD = 1.33). Parents’ ages ranged from 31 to 57 (M = 42.5 years, SD = 5.66), and 78.6% of the reporting parents were mothers, 16.7% fathers, and 4.8% stepmothers. Families were primarily white and of relatively high SES (77.5% reporting earnings greater than $60,000). Children were given a small prize and a certificate of participation. The materials and participants included here were part of a larger study of age differences in social–cognitive information processing.

5.2. Method

Session 1 began with a brief rapport building phase after consent and assent were obtained. Next, a researcher led the child to the experimental room where the child encoded a series of picture–story pairs for which memory would be tested during Session 2. The parent remained in a separate room for the duration of encoding. Prior to starting the video, the child was told that we were “interested in learning about how children think and how their brains work while they watch a video.” Each child was reminded that the second session would consist of measuring brain waves, additional questionnaires, and new activities. Following presentation of the encoding stimuli to the child, the parent was invited to discuss this non-shared encoding event with the child. To conclude Session 1, the parent left the
experimental room so that individual difference measures could be administered to the child and parent independently. One week later, Session 2 began with assessment of free recall for the stimuli encoded during Session 1, followed by administration of a battery of memory tests and individual difference measures; only those relevant to the current paper are described here.

5.2.1. Session 1: encoding

Encoding video. The picture–story stimuli were divided into six specific categories according to the emotion each presented and the presence of an attachment-specific theme. Four of these categories were used in the present analyses to fit within a $2 \times 2$ design; three stimuli each included positive and negative without attachment-specific themes (i.e., happy, sad; low attachment relevant) and positive and negative with explicit mention of attachment-specific themes (i.e., reunion, separation; high attachment relevant). In addition, six neutral stimuli were included to provide a baseline measurement.

Forty-eight picture–story pairs were created (24 to show at encoding, each with a paired distractor). Pictures from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2008) were chosen based on ratings of valence and level of arousal as reported by Lang and colleagues, and additional pictures were gathered from the internet to provide a sufficient stimulus set for ratings. IAPS pictures chosen as neutral had a significantly lower level of arousal than did all emotion types, whereas emotion types (sad, happy, separation, and reunion) did not differ in arousal from one another. Furthermore, positive emotions (happy and reunion) were rated as higher in valence than negative emotions (sad and separation), and both were significantly different from neutral stimuli.

The stories accompanying each picture were designed to provide a context for the picture and more strongly relate the picture to the intended theme. Each story lasted for approximately 30 s, contained approximately 75–85 words, and included the name of the person the story was about along with several details providing a context for the picture and explaining what happened leading to the picture. For instance, one of the separation stories was paired with a picture of a boy screaming at a fence: “Mark is eight years old. His mother and father were driving home from church on Sunday morning when their car was hit by a train just before they reached their house. The ambulance came and two paramedics put them in and rushed them to the hospital. Mark loves his parents very much and watched from the yard with his grandparents. He is very worried that he might never see them again.”

As part of a class activity, undergraduates ($N = 113$) watched one of three slideshows, and they were asked to rate each stimulus for the emotion it elicited, the strength to which that emotion was felt (i.e., arousal), and the relevance it had to relationships (i.e., attachment). Additionally, after viewing the stimuli they were shown pairs of pictures and asked to make similarity ratings (to ensure target and distractor stimuli were equally similar across emotion type). The final set of picture–story pairs was chosen such that the target emotion was consistently chosen (i.e., 80% or more participants agreed), the emotional stimuli (i.e., happy, sad, reunion, and separation) were rated as significantly greater in arousal than neutral stimuli, and the high attachment stimuli (i.e., reunion and separation) were rated as significantly greater in relational relevance than all other categories. To ensure these pictures would be appropriate for a child sample, 22 eight- to twelve-year-old children were shown one of four slideshows, each including 24 picture-story pairs intended for use in the current study. Children were tested in groups of one to four and wrote answers on a questionnaire under the supervision of a researcher. After viewing each stimulus, they were asked to indicate the emotion elicited and how strongly that emotion was felt (i.e., arousal). They were given as much time as needed before moving to the next stimulus. Results showed the modal emotion for each picture matched that chosen by adults. Further, arousal ratings for children mirrored the pattern for adults: emotional stimuli were rated as significantly higher in arousal than neutral stimuli, whereas emotional stimuli did not differ significantly from one another.

The final set of stimuli included 48 pictures paired with 24 stories (2 pictures were paired with each story; each participant viewed only one of the pictures at encoding). The 24 pictures were presented in succession, such that all pictures of the same emotion were grouped, but valence was partially counterbalanced. Thus, some children saw happy scenarios first, whereas other children viewed sad scenarios first. Further, high attachment scenarios were always presented last to permit increasing activation of the attachment system throughout the encoding video for all children; some children...
viewed separation scenarios last whereas others viewed reunion scenarios last. Neutral stimuli were placed between each emotion set (e.g., three happy, one neutral, three sad). To alleviate carry-over effects, participants viewed a series of colored geometric shapes and were instructed to name the colors between each emotion set.

**Parent–child interaction.** Following the encoding video, parents were escorted into the experimental room with their children and left alone while being unobtrusively videotaped. Parents were not given specific instructions, but were informed they could talk to their children about the experiment now and would be asked not to initiate conversation about the experiment after leaving the laboratory. They were given an unlimited amount of time to talk, and on-topic conversations ranged from 1 to 10 min in length. These interactions were coded to provide a measure of parent elaboration.

5.2.2. Session 2: retrieval

**Free recall test.** After a one-week delay (\(M = 7.24\) days, \(SD = 1.26\) days), children returned to the laboratory for Session 2. A researcher led the child to the experimental room, where the child was asked to recall picture-story pairs using four prompts from the interviewer: Can you tell me about one of the picture/stories that you saw and heard? Tell me everything you remember about one of the pictures you saw and stories you heard. Do you remember anything else about that picture or story? Is there anything else you can tell me about that one? These questions were repeated for each stimulus recalled until the child indicated recalling no more stimuli. Recognition and cued recall followed but are not considered in the current analyses.

**Children’s attachment.** When the memory tests were concluded, children completed the Security Scale (Kerns, Aspelmeier, Gentzler, & Grabill, 2001), which included 15 statements about their feelings regarding the responsiveness and availability of an attachment figure, tendency to rely on an attachment figure during stressful situations, and communication with the attachment figure (Kerns, Klepac, & Cole, 1996). After each statement was read aloud, children were asked whether it was like or not like their relationship with their caregiver. A follow-up question was then asked to determine whether it was “really” like/not like or “sort of” like/not like them. Children were provided the option of responding verbally or manually by using a visual aid (a board indicating the four answer options). Because parents were in the adjacent room, children were given the latter response option to ensure their privacy.

Security Scale items were scored from 1 to 4, with higher scores indicating greater security (\(M = 3.39\), \(SD = .38\), and ranged from 2.20 to 4.00; Cronbach’s alpha = .77). This range is similar to other samples (Kerns et al., 2001), and previous studies have reported good reliability (alphas = .63–.93) and validity when using the Security Scale as a self-report attachment measure for middle childhood (e.g., Kerns et al., 1996; Lieberman, Doyle, & Markiewicz, 1999).

**Cognitive ability.** At the conclusion of both sessions, children’s cognitive ability was measured using portions of the Woodcock Johnson Psychoeducational Battery (WJ-III; Woodcock, McGrew, & Mather, 2001). Retrieval fluency was used to account for general language and verbal ability. Children were asked to name as many items as possible for a given category (i.e., names of people, foods, and types of animals) in 1 min. The sum of children’s responses to the three prompts was used as the score for retrieval fluency. Higher scores indicate greater fluency.

**Parental attachment.** While children participated in the second session, parents completed a measure of adult romantic attachment. The Experiences in Close Relationships questionnaire (ECR; Brennan et al., 1998) includes 36 statements about which adults rate their level of agreement (7-point scale; 1 = absolutely disagree, 7 = absolutely agree). It yields scores for attachment avoidance (i.e., discomfort with close relationships) and attachment anxiety (i.e., fear of abandonment or rejection in close relationships), indicators of a two-dimensional characterization of individual differences in adult attachment (Fraley & Shaver, 2000). The mean of the 18 items loading on each scale was calculated, resulting in scores ranging from 1 to 7, with higher scores indicating greater attachment avoidance (\(M = 2.66\), \(SD = 1.15\); Cronbach’s alpha = .95) or anxiety (\(M = 3.09\), \(SD = .85\); Cronbach’s alpha = .85).

5.2.3. Coding

**Parent elaborative interaction style.** The parent–child interaction was transcribed verbatim. Although the current focus is on how parents gather information by recounting unshared events with their
children, the coding scheme was adapted from studies involving reminiscing about shared events (e.g., Burch, Austin, & Bauer, 2004), with a focus on structure. Transcripts were first coded for speech utterances, defined as an explicit or implicit noun–verb pair.

Parent speech utterances were coded for structure. Specifically, each utterance was classified as elaboration (i.e., a question asking for elaboration from the child or a statement providing new information), affirmation (i.e., statements encouraging the child to continue, such as repeating the child exactly or using other content unrelated phrases such as, “I see”), or repetition (i.e., repeating oneself). Because parents were not asked to gather specific information but instead to interact naturally following an unshared event, we regressed total parent utterances out of each structure code, using standardized residuals as our variables (correlated with ratio of elaborations to total utterances, \( r = .87 \)). Because repetition did not occur often, elaborations and affirmations were essentially inverse, thus only elaborations are included in further analyses.

Twenty percent of transcripts were scored by two coders with kappas ranging from .77 to 1.00. Disagreements were resolved and the remaining transcripts were scored by one coder. Because some parents chose not to engage in the interaction portion of the experiment \((n = 6)\) or once engaged elected not to discuss the experimental session (i.e., completely off-topic talk, \(n = 2\)), the dyad could not be transcribed for at least 70% of their turns (e.g., mumbled inaudibly; \(n = 2\)), or the presence of a sibling or other family member was deemed to change the style of the interaction \((n = 1)\), analyses including parent–child interaction variables have a reduced sample size.

**Free recall coding.** To provide a measure of richness and accuracy of children’s recall, children’s reports were transcribed verbatim and all answers about an identifiable picture–story pair were collapsed and counted as one free recall narrative. Each narrative was first divided into units, similar to other studies of children’s memory (Alexander, Goodman et al., 2002). A unit was defined as an explicit or implicit noun–verb pair providing objectively verifiable information about the picture or story being described. Each unit was then coded as accurate or inaccurate. For example, one child recalled information about a separation stimulus, “Her parents were lying down and they were captured by the police,” was coded as two accurate units: “her parents were lying down...” and “...they were captured by the police.” Researchers blind to children’s and parents’ scores on other measures coded 20% of the transcripts. Because units were simultaneously parsed and coded, as in previous recall studies, proportion agreement scores were used (Alexander, Goodman et al., 2002; Schaaf et al., 2008), with reliability ranging from 85 to 97% on all measures. The remainder of the transcripts were scored by one coder. Two dependent variables were of interest for each event type: (1) whether each stimulus was recalled and (2) the number of correct units/details recalled. Because these measures were highly correlated \((r = .86–.94)\), however, only proportion correct details per emotion category are reported.

6. **Results**

6.1. Preliminary analyses

Means for target predictor and memory variables are included in Table 1. To examine whether order of stimulus presentation at encoding affected children’s memory, a series of analyses of variance (ANOVAs) was conducted and no differences were detected, \(F(1, 39) < 1\). Thus, encoding orders are collapsed for further analyses. Next, gender effects were examined. Gender was significantly related to the number of correct details recalled about reunion stimuli, \(t(39) = 2.06, p < .05\), with girls recalling more details, \(M = .73\), than did boys, \(M = .10\). Gender was not associated with recall of other types of stimuli, \(t < 1.10\), and is therefore not considered further.

6.2. Children’s memory within differing emotional contexts

The design of the study permitted controlled examination of children’s memory for events differing in attachment relatedness and valence. A 2 (attachment relevance: high vs. low) X 2 (valence: positive vs. negative) repeated measures ANOVA was conducted with free recall details correct as the dependent measure. Results revealed significant effects of attachment, \(F(1, 40) = 12.75, p = .01\), \(\eta^2 = .24\), and
Table 1
Means for predictor and memory variables.

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>Range</th>
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<tr>
<td>Retrieval fluency</td>
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<td>33–104</td>
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<tr>
<td>Child attachment security</td>
<td>3.40</td>
<td>.38</td>
<td>2.20–4.00</td>
</tr>
<tr>
<td>Parent attachment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoidance</td>
<td>2.66</td>
<td>1.15</td>
<td>1.00–5.06</td>
</tr>
<tr>
<td>Anxiety</td>
<td>3.09</td>
<td>.85</td>
<td>1.61–4.61</td>
</tr>
<tr>
<td>Parent interaction style (proportion)</td>
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<td></td>
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<tr>
<td>Parent elaboration</td>
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<td>.15</td>
<td>.42–.96</td>
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<tr>
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<td>.14</td>
<td>.04–.58</td>
</tr>
<tr>
<td>Parent repetition</td>
<td>.02</td>
<td>.03</td>
<td>.00–.10</td>
</tr>
<tr>
<td>Free recall mean details correct</td>
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<td></td>
<td></td>
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<tr>
<td>Sad</td>
<td>1.12</td>
<td>1.24</td>
<td>.00–5.00</td>
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<td>.23</td>
<td>.69</td>
<td>.00–3.00</td>
</tr>
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<td>Separation</td>
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<td>.96</td>
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<tr>
<td>Neutral</td>
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<td>.00–1.67</td>
</tr>
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</table>

valence, \( F(1, 40) = 29.66, p < .001, \eta^2 = .43 \). The interaction between attachment and valence was also significant, \( F(1, 40) = 4.19, p < .05, \eta^2 = .10 \) (see Fig. 1). Children recalled more correct details about high (i.e., separation and reunion) than low attachment-relevant stimuli, and more about negative (i.e., sad and separation) than positive stimuli. Paired comparisons show that for negative events, children recalled significantly more details about the separation than sad events, and both more than positive events, which were recalled equally well.

6.3. Children’s memory and developmental context

Correlations among predictor variables were examined. Age, retrieval fluency, children’s attachment security, and parental elaboration were largely unrelated. Parental attachment avoidance and anxiety were significantly related to each other, \( r = .53, p < .001 \), but not to other predictor variables. Next, correlations between age and memory variables were investigated. Age was largely uncorrelated with memory with one exception: age was significantly inversely related to correct details recalled about the separation events, \( r = −.31, p < .05 \). Because of consistent research showing relations between age and memory, age is included in further analyses.

Fig. 1. Correct details recalled by attachment relevance and valence.
A primary goal of this study was to examine relative contributions of social variables of attachment and interaction style to children's memory for emotional stimuli. To accomplish this, a series of regressions was conducted with free recall details correct as the dependent variable for each valence × attachment relevance pairing, with child attachment security and parent variables (i.e., attachment avoidance and anxiety and parental elaboration) entered as independent variables. Results were significant for negative high attachment-relevant events (i.e., separation; see Table 2). Attachment security was related to increased recall of correct details about the separation stimuli. Parental avoidance was positively related to children's memory, and parental elaboration during children's recounting of their unshared experience negatively predicted their correct recall.

The addition of free recall of neutral stimuli (to control for general memory ability), retrieval fluency (to control for general cognitive ability), or age to the regression in subsequent steps did not result in a significant $R^2$ change ($R^2$ changes < .06) and the pattern of results remained the same. Regressions for reunion, sad, and happy stimuli were not significant, $R^2$s ≤ .11.

7. Discussion

The results underscore the importance of considering the nature of emotional events in predicting variation in memory, in that not all emotional events are recalled in the same way. In addition, qualities of children's developmental context (i.e., primary social relationships) predict recall. An integrated model of emotional memory has been proposed that draws together each of these elements to help explain the historically inconsistent findings on emotional memory. The current results will be discussed through the lens of this transactional, integrated model (Alexander & O'Hara, 2009).

7.1. Emotion, attachment relevance, and memory

Memory is generally studied in regard to the valence of to-be-remembered events or the degree to which the event is expected to evoke emotional arousal. The current study differentiated the event context beyond arousal. First, our hypothesis that negative stimuli would be better recalled than positive stimuli was confirmed. Previous studies with adults (van Emmichoven, van IJzendoorn, De Ruiter, & Brosschot, 2003) and children (Kirsh & Cassidy, 1997; Perez-Edgar & Fox, 2003) have shown individuals attending to or being more distracted by negative stimuli compared to positive stimuli. Similarly, in the current study it is possible that the negative stimuli drew greater attention during encoding, leading to a richer memory for the stimuli or that at retrieval negative events were more readily accessible, thus causing children to provide more details about such events.

Details about neutral and happy stimuli were recalled little. Numerous studies have shown an advantage for emotional as compared to neutral stimuli (Bishop et al., 2004; Davidson et al., 2001; Kensinger & Corkin, 2003), and there exists a negativity bias in adults and infants (see Vaish, Grossman, & Woodward, 2008, for review). Further research is needed to determine whether this negativity bias in processing contributes to children’s lack of recall for happy stimuli and whether this finding applies to other measures of memory (e.g., recognition).
Third, and perhaps most important, there was a significant interaction between attachment relevance and valence in predicting amount of recall. As expected, children recalled more correct details about separation events than other event types. Insofar as memory for emotional events increases when events are more personally relevant, these findings were expected. Furthermore, stimuli high in attachment relevance likely activate the attachment system, perhaps making the event more salient. This effect was found with overall averages, indicating that regardless of age and individual differences the stimuli including negative attachment-specific content were recalled best. Future research can focus on how the types of details children recalled may differ by attachment relatedness, thus providing additional information about processing of emotional stimuli involving separation.

7.2. Predictors of individual differences in memory

Individual differences in children’s recall of emotional and attachment-evoking stimuli result from multiple mechanisms within the developmental context. Contrary to our expectations, younger children recalled more negative attachment-relevant stimuli than older children, yet other factors in the developmental context were stronger predictors of memory than age. Associations with age did not exist for other stimulus types, perhaps because recall across the age group studied is similar to that of adults (Brehmer, Li, Müller, von Oertzen, & Lindenberger, 2007).

Findings support the hypothesis that children’s attachment security is related to their memory for negative events high in attachment relevance. This result is consistent with a large body of attachment research showing that IWMs, tapped by measures of attachment security, predict the processing of attachment-relevant information (Alexander & Edelstein, 2001; Belsky et al., 1996; Scaaf et al., 2008). More secure children have models of their caregiver as responsive and may thus have greater ability to think about the attachment-evoking events during and after they occur. We found attachment security was not significantly related to memory for reunion stimuli, possibly because positive valence, while rated as equally arousing, was inadequate to evoke the attachment system to the same degree as the separation stimuli. Interestingly, previous studies have shown a relationship between children's attachment and memory for both attachment-relevant positive and negative situations (Belsky et al., 1996; Kirsh & Cassidy, 1997). However, these studies did not directly compare other qualities of emotional events (e.g., arousal; attachment relatedness). Additionally, the present study involved a sample of children in middle childhood whereas previous studies involved preschoolers. Separation stories and pictures (in contrast to reunion stories and pictures) may be especially relevant for children in middle childhood because they are encountering so many novel experiences without their parents. Also, it may be possible that because the reunion pictures were not the natural conclusion to a previous separation (they did not see the accompanied separation), the reunion stimuli were not qualitatively different from any other positive stimuli despite their relational relevance. Interestingly, the current results showed happy and reunion stimuli were correlated with security at similarly positive, non-significant levels.

In the regression analysis, parental attachment predicted children’s memory for separation stimuli. Contrary to our original hypotheses, parental avoidance was positively related to children’s memory. In another study relating parent attachment to children’s memory (Alexander, Goodman et al., 2002), when children were highly distressed, those whose parents reported being less avoidant (i.e., more secure) showed better recall. At lower levels of stress, however, children of the more avoidant parents recalled more details. Because the stimuli in the current study likely did not induce high stress, these results are consistent with such findings. It is possible that during an unshared emotional event, when the parent is not present to scaffold the emotional experience, children are forced to rely on their own internal regulatory processes. When the information is arousing but not highly stressful, and therefore does not tax their coping skills, they are able to organize it coherently despite the disadvantage children of avoidant parents may have in highly stressful situations. For children of less avoidant parents, events with low stress may be those they have had experience processing with parents and may not attract attention more than any other mundane event. More research comparing events inducing high and low arousal in the context of parental attachment might further elucidate this finding.

The results regarding parental anxiety were not significant, as has been true in other studies of children’s emotional memory (Alexander, Goodman et al., 2002). Adult attachment anxiety has been
unrelated to some measures of adults’ processing of emotional and attachment-related stimuli even when avoidance is related (Edelstein et al., 2005; Edelstein, 2006). Although this result requires further study, perhaps the measure of parental anxious attachment used in this study does not tap into parents’ socialization of emotion (see also Edelstein et al., 2004) and thus, does not contribute significantly to children’s recall.

Moreover, contrary to hypotheses, our results indicated that greater parental elaboration during recounting of an unshared event predicted a decrease in memory for separation events when controlling for other variables in the developmental context. Because our measure of parental affirmation was essentially the inverse parental elaboration, these results suggest that increased parental affirmation was associated with children’s greater recall for the separation stimuli. Insofar as older children provide more detailed narrative accounts in general (Trabasso, Stein, Rodkin, Munger, & Baughn, 1992), it is possible that parents who asked for elaboration and/or provided it themselves were not as affectively attuned to their children. Increased efforts of parents to direct the conversation through elaborations in preadolescence may yield children who have not yet transitioned to independent construction of the self-narrative of the emotional event and may present children with decreased opportunities to practice emotion regulation strategies with the scaffolding of a cultural “expert” (Vygotsky, 1978). This is in contrast to children whose parents demonstrate listening by continually affirming the child’s recounting, an interaction strategy perhaps most helpful in the context of an unshared experience with children in this age group. Of course, causality cannot be determined and it is possible parents deemed as less elaborative behave so because they have children who naturally provide more information. Nonetheless, a longitudinal study including measures of parent–child interaction about shared and unshared events would address questions concerning a developmental shift in interaction style. That is, do highly elaborate parents in preschool years ultimately reduce their elaboration to become instead more affirmative when discussing an unshared event with their preadolescent?

8. Conclusions

The current findings underscore the need to consider multiple qualities of events, particularly attachment relatedness, when examining children’s emotional memory. Further, they add to a growing body of evidence that social contextual factors make important contributions to children’s memory about emotional experiences. Despite the theoretical implications of these results, limitations exist. First, the sample was relatively small, particularly for findings involving parental elaboration, and further research is needed to replicate these findings in other, more heterogeneous samples. Second, stimuli were presented via video and thus may have been viewed more similarly to a television show than felt as an experience. Although it is possible such events have a different pattern of relations with attachment, these laboratory results are consistent with previous research and complement naturalistic findings regarding attachment. Personal events may likely only amplify these patterns, making the current findings a conservative estimate of how this model would predict children’s recall. Third, parent–child interactions about real-life emotional events may differ from those about a controlled experimental event in a laboratory environment. Further research can explore effects of experience on the relation between parental elaboration and recall in middle childhood. Future research should also test structural models to identify pathways through which individual differences mediate and moderate mnemonic outcomes for different types of events using various measures of memory.

References


