

Preschoolers' Attention to and Memory for Attachment-Relevant Information

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This study examined the relation between attachment quality in infancy and attention and memory at 3½ years. Sixty-eight children participated in 2 attention tasks and 1 memory task. In the first attention task, children were shown several sets of drawings; each set depicted a different mother-child dyad engaged in positive, negative, and neutral interaction. Insecure/avoidant children looked away from the drawings more than the other children. In the second attention task, children were shown different sets of drawings; each set depicted a mother-child dyad engaged in positive interaction and an adult dyad expressing neutral affect. Insecure/avoidant and insecure/ambivalent children looked away from the mother-child drawings more than the secure children; when children did look at a drawing, insecure children were less likely than secure children to look at the mother-child drawing. In the memory task, children were read 6 stories in which a mother responds to her child's bid for help. In 2 stories the mother responds sensitively to her child, in 2 stories the mother rejects her child, and in 2 stories the mother provides an exaggerated response to her child. Secure children recalled the responsive stories better than insecure/avoidant children and the rejecting stories better than the insecure/ambivalent children. Findings are discussed in terms of the proposition from attachment theory that attachment experiences influence attention and memory processes.

INTRODUCTION

An attachment is defined as the internal organization of the attachment behavioral system in relation to an attachment figure (Ainsworth, 1972; Bowlby, 1973). The quality of an attachment can be either secure or insecure, and, according to Bowlby's attachment theory (1969/1982, 1973, 1980), each attachment is defined by an internal representational model of the attachment figure (also called a "working model"). The development of representational models is thought to begin during infancy, when, based on experiences, the child forms a cognitive model of an attachment figure. Particularly important aspects of these models concern the availability and responsiveness of the attachment figure. A securely attached child is defined as one who has a representational model of the attachment figure as usually available and sensitively responsive when desired. For Bowlby, at the same time the representational model of the attachment figure develops, so does the closely intertwined model of the self. Although Bowlby viewed representational models as remaining open to new input, he believed that because they tend to operate outside the realm of consciousness, they become increasingly resistant to change. Bowlby (1988) described representational models as substantially related to Piaget's notion of schema, and Bretherton (1985) has elaborated on the similarities of these two concepts. Representational models are also similar to constructs such as "mental models," "relational models," and "inter-

personal schema" described within other theoretical perspectives (see Baldwin, 1992, for a review). It is through the mechanism of representational models that attachment is thought to guide children's behavior, feelings, representations, and processing of social information (Bowlby, 1980; Bretherton, 1990; Main, Kaplan, & Cassidy, 1985). Initial attachment research focused largely on the ways in which attachment might influence children's behavior, feelings, and representations (see Belsky & Cassidy, 1994, for a review).

The proposition that attachment influences information processing is based on the notion that to do so would be adaptive by providing psychological protection to the individual as well as by helping to preserve the relationship with the attachment figure (Bowlby, 1980; Main, 1990). For instance, according to Main, an individual whose bids for care have been rejected or belittled may develop a nonconscious strategy of reducing attention to or memory for attachment-related stimuli. Such a cognitive strategy would help ensure that the attachment system is activated only when absolutely necessary, thereby reducing the risk of alienating an attachment figure who did not wish to respond. Although attachment theorists have long proposed that representations of attachment would influence a child's information processing related to social relationships, empirical

examination of this proposition has been rare. In one study, children's interpretation of ambiguous stimuli was associated with attachment. Securely attached 6-year-olds were less likely than insecurely attached children to attribute hostile intent to a peer in an ambiguous situation (Cassidy, Kirsh, Scolton, & Parke, 1996). In another study, attention to attachment-related information was examined, and infant attachment was found to relate to 6-year-olds' attention to a family photograph (Main et al., 1985). Children who had been insecure/avoidant were more likely than other children to avoid looking at the photograph and actively turned away from it.

There are many different ways that attachment schemas and information processing could be related. One body of literature suggests that individuals attend to and remember information that is inconsistent with their schema. According to this perspective, little attention is given to schema-consistent information because the function of a schema is to identify novel information that is not commonly found in a schema (Mandler, 1984; Schank, 1982). In contrast, a second body of literature contends that individuals attend to and remember information that is consistent with their schema. Schemas are thought to guide the processing of new information so that these schemas are confirmed and maintained (Bartlett, 1932; Fiske & Taylor, 1991). Although the literature on schematic processing of information is occasionally contradictory, most research across a variety of domains generally supports the schema-consistent approach to children's information processing.

For instance, in a study of 7- to 12-year-olds, children's positive representations of their mothers' acceptance and support were related to children's biased memory for positive mother-related stimuli (Rudolph, Hammen, & Burge, 1995). Additional evidence that schema-consistent information is remembered better than schema-inconsistent information comes from research on the gender schemas of children in early and middle childhood. Findings have demonstrated that information consistent with societal gender stereotypes was remembered better than information inconsistent with societal gender stereotypes (e.g., men cooking and women fixing cars) (Bauer, 1993; Carter & Levy, 1988; Martin & Halverson, 1983). Moreover, during recall tasks, information inconsistent with societal gender stereotypes was often transformed and recalled as being consistent with stereotypes (Cann & Newbern, 1984; Martin & Halverson, 1983). Data from research examining high-risk children are also relevant. Relatively depressed children, who can be viewed as having a negative self-schema, have been found to show pref-

erential memory for (schema-consistent) negatively valenced material (Hughes, Worchel, Stanton, Stanton, & Hall, 1990; Zupan, Hammen, & Jaenicke, 1987). In addition, maltreated children, who are assumed to have particularly negative representations of an abusing attachment figure, have been found to "show restrictions in areas of attention" (Rieder & Cicchetti, 1989, p. 389) and to "attend selectively to and elaborately describe negative aspects of relationships" (McCrone, 1994, p. 116). Our review of previous studies examining links between children's schema and their information processing led to our hypotheses that children would process attachment-relevant information in ways consistent with their attachment representations.

The goal of this study was to examine the connection between attachment and the cognitive processes of attention and memory in young children. To this end, we used two attention tasks and one memory task with 3½-year-olds. The first attention task assessed children's attention to several sets of three drawings; each drawing depicted a different mother and child. In each set, one drawing depicted a positive dyad, one depicted a neutral dyad, and one depicted an angry dyad. We expected to find, as did Main and her colleagues (Main et al., 1985), that avoidant children would look away from these attachment-related stimuli more than other children. We also expected attachment-related differences in what children chose to look at when they did look at the stimuli. In keeping with previous literature about schema and information processing, we expected that children would attend to the stimuli that confirm their schema of the mother-child relationship—that is, stimuli most like their own experience. In particular, we expected that secure children would look at the positive dyad more than other children, insecure/avoidant children would look at the neutral dyad more than other children, and insecure/ambivalent children would look at the angry dyad more than other children.

The second attention task examined children's attention to several two-drawing sets. In these sets, only one drawing depicted a (positive) mother and child; children also had the option of looking at a nonattachment picture. We expected that insecure/avoidant children would again look away from the attachment-related stimuli more than other children. We also expected that, when looking at the drawings, secure children would be more likely than insecure children to look at the attachment picture because it was positive and thus schema consistent. Given that for both insecure/avoidant and insecure/ambivalent children the positive attachment-relevant pic-

tures were schema-inconsistent, the two insecure groups were combined on conceptual grounds for this analysis.

To assess children's memory for attachment-related stimuli, we read six attachment-related stories to the children, and later asked them questions about the content. The stories varied as a function of a mother's response to a child's distress. In two stories the mother was sensitively responsive, in two stories she was rejecting, and in two stories she provided an exaggerated response that emphasized the child's distress. Our predictions were based on findings of research on children's memory for schema-consistent and schema-inconsistent information. We expected that for the responsive stories, secure children would have the best memory because of their experiences with a responsive mother, and insecure/avoidant children would have the worst memory because they lacked such a mother. For the rejecting stories, we expected that insecure/avoidant children would have the best memory because of their experience of rejection, and that insecure/ambivalent children, because they lacked experiences in which their requests for care were minimized (Cassidy & Berlin, 1994), would have the worst memory. For the exaggerated response stories, we expected that the insecure/ambivalent children would have the best memory because of their experience with mothers who exaggerate their dependence, and that insecure/avoidant children would have the worst memory because their mothers tend to minimize rather than emphasize their children's dependence (Ainsworth, Blehar, Waters, & Wall, 1978).

We also had hypotheses regarding memory for the different stories within attachment groups. Based on the schematic representations mentioned above, we expected that secure children would recall the responsive story type better than the other story types, insecure/avoidant children would recall the rejecting stories the best, and insecure/ambivalent children would recall the exaggerated response stories better than the responsive or rejecting stories.

METHOD

Sample

Participants were 68 children (44 boys, 24 girls) recruited from mostly European American (97%), middle-class (76% had an income of \$30,000 or more), two-parent (92%) families in central Pennsylvania. The mean age of the children was 45 months ($SD = 1.7$; range = 42–50 months). Children were part of a larger study examining emotions and memory in

mothers and young children. Eighty-nine percent of original participants whom we contacted agreed to participate at age 3½. Of the nine who did not participate, five had moved away. Due to a variety of factors (e.g., refusal to participate, time constraints, equipment failure), seven children failed to complete the first attention task, nine children failed to complete the second attention task, and 13 children failed to complete the memory task. Families were paid \$20 for their participation.

Procedures and Measures

Children participated in Ainsworth's Strange Situation with the mother when they were between 15 and 18 months of age, and returned to the laboratory at age 3½ for a series of assessments that lasted approximately 1½ hr. During a portion of the session with the mother present, both attention tasks were administered. The second attention task was conducted immediately following the completion of the first attention task. Later, when the mother was out of the room, half of the memory task was administered. Approximately 7 to 10 days after the laboratory visit, a 1½ hr home visit, which also consisted of a series of assessments, was conducted. During this session, the second half of the memory task was administered, and children's general cognitive functioning was assessed.

Attachment

Infant attachment to mother was assessed with Ainsworth's Strange Situation, a 20 min laboratory procedure in which the parent and a female stranger alternately leave and return to the infant, who remains in the toy-filled playroom (Ainsworth et al., 1978). Secure infants show interest in interaction with or proximity to the parent, with none of the avoidance characteristic of the insecure/avoidant infants or the ambivalence characteristic of the insecure/ambivalent infants. Recently, a third insecure category has been identified in which infants demonstrated "disorganized" behaviors (Main & Solomon, 1990). Under Ainsworth's traditional classification system, however, a few of these insecure/disorganized infants ($n = 7$) would be considered secure. For the present study, these infants were not included in the principle analyses so that we might examine a homogeneous group of truly secure infants. However, insecure/avoidant and insecure/ambivalent infants exhibiting disorganized behaviors were included in the insecure/avoidant group and the insecure/ambivalent group, respectively. For our research ques-

tions, it was not necessary to distinguish between insecure infants and insecure infants exhibiting disorganized behavior. This is because it is the basic organization of attachment that is thought to guide attention and memory. Thus, conceptually, for instance, both avoidant and disorganized avoidant insecure children are thought to be guided by fundamental attempts to restrict attention to and memory of stimuli that might activate the attachment system.

Although we were guided by a theoretical perspective in which it is the basic organization of attachment that guides attention and memory, the possibility exists that the presence of disorganization does, in fact, influence children's information processing. Thus, excluding disorganized/secure children from the sample, while at the same time including disorganized/insecure children, makes it unclear whether attachment group differences are due to the security versus insecurity dimension, as we claim, or instead are due to the fact that one group (the insecure group) contains children whose earlier attachment to mother had been disorganized, and one group (the secure group) does not. To address this issue, we conducted a set of companion analyses in which disorganized/secure children were included in the secure group.

Attachment was coded by three independent coders blind to the study's hypotheses. Two coders coded each Strange Situation videotape for all but three participants. Inter-coder agreement, based on at least 15 cases per pair of coders, was calculated at the level of the analyses used in this report (A and D/A infants combined, C and D/C infants combined, B infants, and D/B infants). For each pair of coders, agreement exceeded 80%; Cohen's kappa ranged from .45 to .64 ($M = .56$). Disagreements were resolved by conference.

Attention Tasks

To assess the relation between attachment quality and attention, two tasks were conducted that measured children's looking behavior among various types of stimuli. The first task evaluated attention preferences among three types of attachment-relevant stimuli, whereas the second task measured preferential looking behavior in relation to information both relevant to and not relevant to attachment.

For both attention tasks, children were seated on a small stool and told that they were going to watch some pictures. To ensure that children were looking at the middle of the screen prior to the presentation of the stimulus slides, children were trained to look at a colored circle displayed in the middle of the pre-

sensation screen and say "dot" when the circle was presented. When the experimenter, seated to the left of the child, determined that the child was fixating on the colored circle, the stimulus slide was shown. For both attention tasks, slides were projected onto the center of a large piece of white cardboard affixed to the bottom half of a one-way mirror. The stimuli were presented in children's peripheral visual fields such that shifts in gaze from the center of the screen to a stimulus or from stimulus to stimulus were easily monitored.

Children's eye movements were videotaped through the one-way mirror. One observer, blind to the position of the different interaction drawings and blind to attachment classification, recorded the direction of children's eye movements and the length of time fixating on a particular drawing. A second observer, also blind, scored 19 (32%) randomly selected tapes. Disagreements were resolved by a third independent, also blind, observer. For both attention tasks, interrater reliability ranged from 94% to 95% (agreement) for duration and .92 to .94 (Cohen's kappa) for direction.

Attention Task 1. Children were shown six sets of three drawings, each of which was shown for approximately 8 s.¹ Each drawing depicted a different mother and child; each set combined three types of interaction: positive, negative, and neutral. The positive interaction drawing portrayed a mother-child dyad engaging in positive interaction (e.g., hugging) and displaying positive affect (e.g., smiling). The negative interaction drawings depicted a mother-child dyad engaging in mutual angry interaction (e.g., yelling) and displaying negative affect (i.e., anger). The neutral interaction drawings were of a mother-child dyad looking away from each other and displaying neutral affects. Drawings were designed to be equivalent in terms of complexity, size of figures, and amount of background detail. For each set of three drawings, one was placed in the far left-bottom of the screen, in the far right-bottom of the screen, and top-middle of the screen. Across trials, each interaction type appeared twice, in each of the three positions. One random order was presented to all participants.

Attention Task 2. Children were shown eight two-drawing sets of drawings for approximately 6 s each.² Each drawing combined a different mother and child; each set contained two different types of interaction: mother-child and adult-adult. The mother-child drawings were of a mother-child dyad engaged in

1. Because of occasional small differences in presentation time, proportion scores were used.

2. See n. 1 above.

positive interaction and displaying positive affect (e.g., smiling at each other). The adult-adult drawings portrayed two adults looking away from each other and displaying neutral affect (e.g., two adults waiting at a bus stop). Drawings were designed to be equivalent in terms of complexity, size of figures, and amount of background detail. The adult-adult and mother-child drawings each appeared on the left and the right side of the slide an equal number of times. One random order was presented to all participants.

Memory for Attachment-Relevant Information

Six stories seven to eight sentences in length depicting a child's bid for care following a minor injury while playing alone outside were read to each child. Children in the stories were the same gender as the participant. There were three counterbalanced story types that varied as a function of the mother's response to the child's bid. In the Rejecting story type, the mother rejected the child's bid for care; in the Responsive story type, the mother responded to the child's bid for care with sensitivity; in the Exaggerated Response story type, the mother overreacted to the child's minor injury by crying herself and carrying the child home. One story of each type was told in the laboratory and another story of each type was told in the home.³

Following each story, the child's memory was probed with a cued recall procedure. Children were asked seven questions about the events that occurred during the beginning, middle, and end of the story (e.g., "What was the child doing at the beginning of the story?" "What did the child's mom do?"). Children's answers were audiotaped, transcribed, and coded from verbatim transcripts. For each story type, the child's score reflected the number of questions answered correctly (possible range, 0–14). One coder, blind to attachment classification, coded the transcripts. A second coder, also blind, coded a randomly selected 25% of the transcripts. Interrater reliability was .92 (Cohen's kappa).

General Cognitive Functioning

Children's general cognitive functioning was assessed using the Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 1981). During this procedure, children were presented with a series of items, each of which contained four illustrations, and asked to identify the picture that best illustrated the meaning

of a stimulus word presented to them orally. A standardized score was computed for each participant. Although this measure was originally designed to measure receptive language, the PPVT score has been related to general intelligence in white, middle-class samples (Sattler, 1988).

RESULTS

Attention Task 1

Preliminary analyses were conducted to assess the relation between general cognitive functioning and attention. PPVT scores were not related to looking behavior and therefore were not included in subsequent analyses. In this task, all pictures contained attachment-relevant material. First, we expected that insecure/avoidant children would look away from these attachment-relevant drawings more than other children. A between-subjects analysis of variance (ANOVA) revealed significant attachment differences in the proportion of time spent looking away from the stimuli, $F(2, 58) = 4.54, p < .01$. Follow up Duncan multiple-range tests revealed that insecure/avoidant children ($M = 17\%$; $SD = 7\%$) looked away proportionally longer than both secure ($M = 11\%$; $SD = 6\%$) and insecure/ambivalent ($M = 10\%$; $SD = 4\%$) children. Next, a series of between-subjects ANOVAs was conducted to test for attachment group differences in the amount of time children looked at each picture as a proportion of total time spent looking at all three pictures. This allowed us to look at attachment group differences in preferential looking when children were looking at the drawings. We expected that secure children would look at the positive dyad more than other children, insecure/avoidant children would look at the neutral dyad more than other children, and insecure/ambivalent children would look at the angry dyad more than other children. Only two ANOVAs were conducted to test for mean differences in attention because the use of percentages created dependence among the dependent variables. None of the analyses was significant.⁴ Table 1 presents the means and standard deviations of the proportion of time looking at the various picture types. In the companion analyses, when disorganized/secure children were included in the secure group, no attachment group differences emerged.

4. Similar results were found using arcsine transformed proportions, but we chose to use the untransformed data because they more accurately reflect the observed behavior.

3. Stories are available from the first author.

Table 1 Means and Standard Deviations of the Proportion of Time Looking at the Mother-Child Interaction Pictures in Attention Task 1

Attachment Quality	Interaction Type		
	Positive	Negative	Neutral
Secure ($n = 37$)	.29 (.05)	.42 (.07)	.29 (.06)
Insecure/avoidant ($n = 13$)	.28 (.05)	.44 (.08)	.28 (.06)
Insecure/ambivalent ($n = 11$)	.30 (.05)	.38 (.06)	.33 (.05)

Note: Standard deviations are in parentheses.

Attention Task 2

Preliminary analysis indicated that PPVT scores were not related to looking behavior and therefore were not included in further analyses. Our second analysis of this task examined children's looking away from the attachment-relevant drawing, which was defined as time spent looking at the nonattachment drawings plus time spent looking away from both stimuli. We expected that insecure/avoidant children would look away from the attachment-relevant drawings more than other children. A between-subjects ANOVA was significant, $F(2, 56) = 5.28$, $p < .008$. Post hoc Duncan multiple-range tests revealed that, as expected, insecure/avoidant children ($M = 61\%$; $SD = 12\%$; $n = 11$) looked away from the attachment-relevant drawings for a longer proportion of time than secure children ($M = 54\%$; $SD = 8\%$; $n = 37$). Insecure/ambivalent children ($M = 62\%$; $SD = 7\%$; $n = 11$) also looked away from the attachment-relevant drawings for a longer proportion of time than secure children. Similar significant findings emerged in the companion analyses when disorganized/secure children were included in the secure group.

Next, the amount of time children looked at each picture type was calculated as a proportion of total time spent looking at both picture types. This allowed us to look at attachment group differences in preferential looking when children were looking at the drawings. Only one between-subjects ANOVA was conducted to test for mean differences in attention because the use of percentages created dependence between the dependent variables. Results matched our expectations. When looking at the drawings, secure children ($M = 54\%$; $SD = 8\%$; $n = 37$) looked at the attachment-relevant pictures for a longer proportion of time than insecure children ($M = 48\%$; $SD = 8\%$; $n = 22$), $F(1, 57) = 6.78$, $p < .02$.⁵ Similar significant findings arose in the companion

analyses when disorganized/secure children were included in the secure group.

Memory

Preliminary analyses were conducted to test for differences in general cognitive functioning. Results indicated that the between-subjects ANOVA was significant, $F(2, 52) = 3.95$, $p < .05$. Follow-up Tukey tests indicated that insecure/ambivalent children ($M = 114$; $SD = 12$) had significantly higher PPVT scores than insecure/avoidant children ($M = 100$; $SD = 15$). No significant differences were evident between the secure children ($M = 110$; $SD = 11$) and the other attachment groups. Next, to investigate the relation between general cognitive functioning and memory performance for each story type, a series of Pearson correlation coefficients was conducted. For each story type, results indicated a significant relation between the PPVT and memory performance: Responsive story type, $r(54) = .41$, $p = .002$; Rejecting story type, $r(54) = .31$, $p = .02$; Exaggerated Response story type, $r(54) = .35$, $p = .008$. Given the significant ANOVA and correlations, PPVT was entered as a covariate for subsequent analyses.

Mean differences in memory were examined with a 3 (story type) $\times$ 3 (attachment) repeated-measures analysis of covariance (ANCOVA). For the Responsive stories, we expected that secure children would have the best memory and insecure/avoidant children would have the worst memory. For the Rejecting stories, we predicted that insecure/avoidant children would have the best memory and insecure/ambivalent children would have the worst memory. For the Exaggerated Response story type, we anticipated that insecure/ambivalent children would have the best memory and insecure/avoidant the worst memory. In addition, we expected that secure children would recall the Responsive stories better than other stories, insecure/avoidant children would recall the Rejecting stories better than other stories, and

5. See n. 4 above.

Table 2 Attachment Group Means and Standard Deviations for the Attachment Stories

Attachment Group	Story Type		
	Responsive	Rejecting	Exaggerated Response
Secure ($n = 34$)	11.4 ^{acd} (3.2)	9.9 ^{bce} (2.5)	8.8 ^{de} (2.5)
Insecure/avoidant ($n = 10$)	8.2 ^a (4.4)	8.0 (3.8)	7.8 (3.3)
Insecure/ambivalent ($n = 11$)	9.3 ^b (3.9)	7.1 ^{bf} (5.0)	7.7 ^b (3.5)

Note: Standard deviations are in parentheses. Superscript notation for mean values denotes a significant difference for like letters within the relevant rows and columns.

insecure/ambivalent children would recall the Exaggerated Response stories better than other stories.

The main effect for attachment and the attachment $\times$ story type interaction effect were both significant, $F(2, 51) = 3.20$, $p < .05$, and $F(4, 104) = 2.55$, $p < .05$, respectively. Results indicated that our hypotheses were only partially supported. Post hoc Duncan multiple-range tests revealed that secure children recalled the Responsive stories better than insecure/avoidant children and the Rejecting stories better than insecure/ambivalent children. No differences were evident between insecure/avoidant and insecure/ambivalent children or in relation to the Exaggerated Response stories. In the companion analyses, when disorganized/secure children are added to the secure group, only the attachment $\times$ story type interaction effect remained significant, $F(4, 118) = 3.16$, $p < .02$; the attachment main effect was not significant. Post hoc analyses revealed that secure children recalled the Responsive stories better than the insecure/avoidant children. No other analyses in which disorganized/secure children were included were significant.

In addition, within-subjects follow-up tests partially supported our hypotheses. As expected, follow-up Duncan multiple-range tests for secure children indicated that the Responsive story type was recalled better than both the Rejecting story type and the Exaggerated Response story type. In addition, the Rejecting story type was recalled better than the Exaggerated Response story type. In contrast to our expectations, Duncan multiple-range tests indicated that insecure/ambivalent children recalled the Responsive story type better than the Rejecting story type and the Exaggerated Response story type. Unexpectedly, no significant differences were obtained for the insecure/avoidant group. Table 2 presents the means and standard deviations for the total scores for each story type. In the companion analyses, similar significant findings emerged when disorganized/secure children were included in the secure group.

DISCUSSION

This study investigated attachment-related differences in young children's attention and memory. We start by discussing the results from our a priori principle data and then address the findings from the set of companion analyses in which disorganized/secure children were included in the secure group.

Attention Task 1

The results of the first attention task, in which all pictures were attachment-relevant, offer some support for the contention that representational models are related to attention toward attachment-relevant information. The finding that insecure/avoidant children looked away from the pictures more than secure or insecure/ambivalent children is consistent with the finding of Main and her colleagues (1985) that insecure/avoidant 6-year-olds avert their gaze from family photographs (which clearly provide attachment-relevant information) more often than other children. Thus, insecure/avoidant children appear to exclude from awareness and processing information that, because of their experiences, may be distressing. This averting process may allow insecure/avoidant children to decrease their level of arousal to a point that does not typically result in attempts to obtain care, an understandable strategy for children whose attempts to gain care are often rejected. An alternate explanation for the gaze aversion finding is that insecure/avoidant children had more difficulty staying on task than any other attachment group. Accordingly, the attachment-related differences in gaze aversion may be due to general inability to focus rather than a shifting of attention away from attachment-related information.

Our expectation that children would attend to information consistent with their attachment schema was not supported. One reason for this may be the nature of the stimulus materials and the fact that one

drawing in each set always contained depictions of anger. Bowlby (1973) has suggested that children are often drawn to what is threatening, and our data partly support this contention, at least for secure and insecure/avoidant children. Chi-square analyses demonstrated trends ($p < .10$) for both of these groups of children to attend to depictions of anger. Thus, it may be that attachment-related attention preferences for schema-consistent information occur only when threatening stimuli are not present. In sum, in this task, attachment quality was related to whether or not children attended to attachment-relevant information but was not related to attention toward different types of attachment-relevant information.

Attention Task 2

For this task, children were given the choice of attending to attachment-relevant positive interaction or nonattachment-relevant neutral interaction. Our hypotheses were only partially confirmed. As expected, insecure/avoidant children looked away from the stimuli significantly more often than secure children. Once again, these results suggest that insecure/avoidant children may exclude potentially distressing information from awareness and processing (Main & Solomon, 1990). Unexpectedly, insecure/ambivalent children also looked away from the attachment-relevant drawings more than secure children. These findings contradict expectations that insecure/ambivalent children are vigilant toward all types of attachment-relevant information (Main, 1990). Yet it may be that insecure/ambivalent children also looked away from the attachment-relevant stimuli to avoid arousing painful memories, but in this case memories not of a rejecting caregiver but of an inconsistent caregiver.

Our second hypothesis related to this task was supported. Only secure children experience generally positive attachment-related interactions (Ainsworth et al., 1978), and in the present task, only secure children appeared to exhibit an attentional bias for positivity. Thus, secure children may attend to experiences consistent with their early attachment history. This finding provides support for the contention that children attend to information consistent with their attachment schema.

During the second attention task, in contrast to the first assessment of attention, depictions of anger were not shown to children. Taken together, the results from both assessments suggest that representational models may be related to attention toward information consistent with attachment history, but only

when threatening information is not present. It may be that all children are attracted toward threatening information, regardless of whether that information is schema consistent or schema inconsistent.

Memory

Findings from the memory task revealed that secure children remember both Responsive and Rejecting stories better than some insecure children. The fact that secure children show better memory for both positive information (i.e., the ending of the Responsive stories) and negative information (i.e., the ending of the Rejecting stories) is consistent with previous literature suggesting that security is associated with openness to a range of emotions. For instance, there is some indication that secure children are less likely than other children to restrict expression of positive or negative emotions, and that the mothers of secure children are less likely than other mothers to restrict selectively some aspect of children's emotional expressions (see Bretherton, 1990, and Cassidy, 1994, for reviews). Similar patterns of flexible memory are seen in the mothers of secure children, who typically remember both the positive and negative aspects of their relationships with their own parents (Main & Goldwyn, in press). Furthermore, these data suggest that for memory, at least as assessed here, secure children remember information that is both consistent and inconsistent with their attachment schema. It may be that attachment security provides for flexibility and openness in the processing of attachment-relevant information. Thus, schematic models alone may not be able to account for children's processing of attachment-relevant information.

It is interesting to speculate about whether children are less likely to remember the sorts of attachment interactions with which their mothers are uncomfortable. There is evidence that mothers of insecure/avoidant children may be uncomfortable with providing comfort when sought by their distressed child (Ainsworth et al., 1978; Haft & Slade, 1989; Main, 1990), and insecure/avoidant children remember these stories significantly less than secure children. For insecure/ambivalent children, there is evidence that mothers may be uncomfortable with interaction that minimizes the child's dependency on the mother (Cassidy & Berlin, 1994) and insecure/ambivalent children remember these stories significantly less than secure children. We should point out, however, that our memory measure cannot distinguish failure to recall specific memories from reluctance to report on what is remembered. Thus, the

possibility exists that in the present study insecure children's failure to report story content may actually reflect a failure to report information that was remembered.

The Exaggerated Response stories are the only stories for which no attachment group differences emerged. Thus, it may be that representational models may not relate to memory for all types of attachment-relevant information. However, it also may be that the mother's response to the child's injury in these stories (i.e., the child is "picked up and treated like a little baby") was too ambiguous and thus interpreted in many different ways by these young children.

Within-attachment-group analyses indicated that secure and insecure/ambivalent children recalled the Responsive story type better than the other story types, but insecure/avoidant children did not. Thus, only for secure children is there support for the contention that children's memory is best for schema-consistent information, at least as we defined schema-consistent information for the different attachment groups. It may be that maternal responsiveness is incorporated into the schema of insecure/ambivalent children sufficiently (albeit less than in the schema of secure children) to enable these children to have preferential memory for the responsive stories. The fact that only insecure/avoidant children do not show preferential memory for the Responsive stories may reflect their attachment experiences. There is evidence that insecure/avoidant infants have had their bids for comfort rejected more than other infants, and that their mothers are more aversive to close bodily contact (Ainsworth et al., 1978).

Implications and Conclusions

Attachment-related differences in cognitive processing have important implications for understanding children's development. First, Main has proposed that regulation of attention is an important mechanism through which the individual regulates the attachment system (1990; Main & Hesse, 1990). Insecure attachment is thought to involve attempts to either heighten or suppress activation of the attachment system in a nonconscious attempt to behave in ways with which the parent feels most comfortable, thus ensuring the child relative access to the parent if needed (Cassidy & Berlin, 1994; Main, 1981). According to Main, manipulation of attention serves an important function for the child. Insecure/avoidant children, for instance, are thought to turn attention away from mildly alarming stimuli that might activate the attachment system, thereby protecting them-

selves from the painful rejection that was experienced when their attachment system was activated in the past. Insecure/ambivalent children, on the other hand, are thought to turn their attention toward even mildly alarming stimuli so that the attachment system is easily activated, thereby capturing the attention of an otherwise preoccupied caregiver (Main & Hesse, 1990). The data from this study support the notion that insecure/avoidant children turn attention away from attachment-related stimuli, but find no evidence of insecure/ambivalent children turning toward the stimuli.

Second, biases in attention and memory may be one process through which early attachment experiences contribute to later functioning. The following pathway has been proposed: (1) early attachment experiences contribute to mental representations, (2) mental representations guide cognitive processes, including attention and memory, and (3) these cognitive processes influence children's later social relationships and emotional functioning. For instance, there is converging evidence that infant attachment relates to children's peer relations (see Belsky & Cassidy, 1994, for a review), with insecure/avoidant children having the most problematic relationships. Biases in attention and memory may contribute to this connection. The memory data from this study suggest that insecure/avoidant children do not have the bias toward remembering responsive interactions that the other children do; such a memory pattern may contribute to these children behaving in aversive ways leading to their being disliked.

The results of our principle analyses provided the important information that truly secure children (group B children; D/B children excluded) process information differently from insecure children. Yet these analyses leave unanswered the question of whether these attachment group differences can be attributed to basic security versus insecurity or to the overlay of disorganization within the insecure group. A companion set of analyses in which the disorganized/secure (D/B) children were included yielded similar significant findings for Attention Task 2 and the memory task, but nonsignificant findings for Attention Task 1. Thus, at least for the former two tasks, it does not seem to be the case that attachment group differences reflect only differences in the amount of disorganization. Furthermore, the fact that the insecure/avoidant and insecure/ambivalent groups (which are similar in having some members labeled disorganized yet dissimilar in their basic underlying attachment patterns) were generally found to process information differently from each other suggests that the disorganization common to the two

groups is not the driving force for attention and memory processes. It is even possible that the inclusion of disorganized children in secure, insecure/avoidant, and insecure/ambivalent groups may lower our ability to detect attachment-related differences in information processing. Replication with a sample containing a sufficiently large number of children in each attachment group, both with and without an overlay of disorganization, will provide further important information.

In sum, these data revealed connections of both attention and memory for attachment-relevant information with attachment quality. Findings, however, were not always in the predicted direction, in that information consistent with caregiving histories was not always attended to the most or recalled the best. In addition, the amount of variance accounted for by the significant findings was small. Thus, the direct relation between attachment quality and memory and attention remains unclear and requires replication. Nevertheless, our data provide information that supports Bowlby's (1980) contention that the early relationship with mother may be related to children's later processing of information.

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