Attachment and the Processing of Social Information Across the Life Span: Theory and Evidence

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Researchers have used J. Bowlby’s (1969/1982, 1973, 1980, 1988) attachment theory frequently as a basis for examining whether experiences in close personal relationships relate to the processing of social information across childhood, adolescence, and adulthood. We present an integrative life-span–encompassing theoretical model to explain the patterns of results that have emerged from these studies. The central proposition is that individuals who possess secure experience-based internal working models of attachment will process—in a relatively open manner—a broad range of positive and negative attachment-relevant social information. Moreover, secure individuals will draw on their positive attachment-related knowledge to process this information in a positively biased schematic way. In contrast, individuals who possess insecure internal working models of attachment will process attachment-relevant social information in one of two ways, depending on whether the information could cause the individual psychological pain. If processing the information is likely to lead to psychological pain, insecure individuals will defensively exclude this information from further processing. If, however, the information is unlikely to lead to psychological pain, then insecure individuals will process this information in a negatively biased schematic fashion that is congruent with their negative attachment-related experiences. In a comprehensive literature review, we describe studies that illustrate these patterns of attachment-related information processing from childhood to adulthood. This review focuses on studies that have examined specific components (e.g., attention and memory) and broader aspects (e.g., attributions) of social information processing. We also provide general conclusions and suggestions for future research.

Keywords: attachment, attachment styles, information processing, social cognition, Adult Attachment Interview

Decades of research have shown that across the life span, individuals differ in how they process information in their social environments. Social information related to parents, peers, and romantic partners, for example, is often processed with varying degrees of accuracy, objectivity, and positivity. These and other variations in social information processing are considered to play a significant role in development because they affect individuals’ social and emotional adaptation across the life span (Bowlby, 1973; Dodge & Pettit, 2003; Fletcher, Overall, & Friesen, 2006; Gifford-Smith & Rabiner, 2004; Sacco & Vaughan, 2006). Thus, researchers have sought to identify the factors associated with individual differences in social information processing (see Dodge & Pettit, 2003, for a review), and emerging theory and data lend considerable support to the notion that an important source of these differences is individuals’ experiences in close personal relationships.

One perspective that continues to receive considerable attention from psychologists interested in understanding the emergence of individual differences in social information processing is attachment theory (Bowlby, 1969/1982, 1973, 1980, 1988; see also Cassidy & Shaver, 1999, 2008). This attention stems from one of the theory’s principal notions—that social information processing patterns are lawful and emerge directly from the ways in which individuals have mentally internalized their experiences within close relationships. In this regard, John Bowlby (1973), the originator of attachment theory, advocated for the particular importance of attachment experiences (e.g., experiences of children with their principal caregivers). He theorized that humans have evolved to develop experience-based mental representations (internal working models) of attachment relationships and that such models function to assist individuals in gathering and interpreting information related to an array of social agents (such as parents, peers, and romantic partners). Yet, because the internal working models forged from attachment experiences can be either qualitatively favorable or qualitatively unfavorable (i.e., secure or insecure), the functions performed by these models can ultimately lead to either adaptive or maladaptive social information processing patterns. Thus, by knowing the quality of individuals’ internal working models of attachment, theoretical predictions and explanations can be made about how individuals will process a wide array of social information.

The literature on attachment and social information processing has grown considerably since Bowlby (1969/1982, 1973, 1980, 1988) first formulated his theory. During the past few decades,
contemporary attachment theorists have advanced Bowlby’s conceptualization of the internal working model construct and have shown that such conceptualizations are consistent with current theory and research in cognitive neuroscience (such as that related to mirror neuron systems; see Bretherton & Munholland, 2008). Investigators have also collected much empirical evidence chronicling internal working model processes in regard to attachment-relevant social information processing. Interestingly, however, these empirical advances have added substantial complexity to existing theory and have even provided some conceptual challenges along the way. For example, in the child, adolescent, and adult literatures, insecure attachment has been linked to poorer memory for attachment-relevant social information in some studies but to enhanced memory in others. Secure attachment, in contrast, has been linked to the processing of a wide array of attachment-relevant social information, regardless of whether it has a positive or a negative valence. These and other intriguing data patterns enhance the richness of the attachment literature and are notable given some researchers’ claims (e.g., Hinde, 1988; Rutter, 1995) that the internal working model construct has been too broadly conceptualized and has lacked empirical support.

Our aim is to review and integrate into a theoretical and life-span–encompassing model the many important conceptual and empirical advances in the study of attachment-relevant social information processing. We begin by discussing the form and function of internal working models of attachment and then present Bowlby’s (1969/1982, 1973, 1980, 1988) thinking about two ways in which individual differences in the processing of attachment-relevant social information can be understood: (a) as reflections of strategies for avoiding potential psychological pain or (b) as indicators of experience-based, schema-driven processing. After presenting this theoretical background, we review the empirical literature examining relations between attachment and social information processing in childhood, adolescence, and adulthood. Next, we describe research on the intergenerational connections between attachment and information processing in children and their parents. We end with general conclusions based on our review of the literature, propositions adding greater specificity to previous theorizing, and suggestions for future research.

**Attachment and Social Information Processing: A Theoretical Perspective**

The Core Concept of Internal Working Models

According to attachment theory, infants are biologically predisposed to form attachments to available adult caregivers (i.e., parents and other principal biologically and nonbiologically related caregivers). These attachments form because infants see their adult caregivers as safe havens who demonstrate—typically on a repeated daily basis—an investment in the infant’s survival by protecting the infant (e.g., by ameliorating a fearful situation for the infant or by soothing the infant when ill or in pain; Bowlby, 1969/1982; see also Goldberg, Grusac, & Jenkins, 1999). Attachments are also characterized by the tendency of infants to use their caregivers as secure bases from which they can confidently explore their environments during normal day-to-day activities (Bowlby, 1969/1982; Goldberg et al., 1999; E. Waters & Cummings, 2000). Access to a secure base is developmentally significant because one of the infant’s core developmental tasks involves mastering the environment (see K. E. Grossmann, Grossmann, & Zimmermann, 1999; see also Sorce & Emde, 1981, for experimental evidence that a parental secure base enhances exploration).

Through repeated daily experiences with attachment figures, infants (between the ages of 6 and 9 months) begin to acquire event-based information of their attachment figures’ tendencies to be available, responsive, and sensitive to the infant’s needs for contact and desire for exploration (see Ainsworth, Bell, & Stayton, 1971; Bowlby, 1973; Marvin & Britner, 2008; see also Stern, 1985). Bowlby drew on the work of Young (1964) and theorized that this knowledge likely emerged through the formation of mental structures representing the realistic reproduction, or “mental simulation,” of previous interactions with attachment figures (see Bretherton & Munholland, 1999, 2008). Bretherton (1985, 1991) later proposed that this knowledge likely constitutes cognitive structures called scripts (which H. S. Waters and her colleagues labeled secure base scripts; H. S. Waters & Waters, 2006; H. S. Waters, Rodrigues, & Ridgeway, 1998; see also Fivush, 2006; Nelson & Gruendel, 1986; Schank & Abelson, 1977; Stern, 1985). These scripts are considered to provide infants with a causal–temporal prototype of the ways in which attachment-related events typically unfold (e.g., “when I am hurt, I go to my mother and get comfort”).

According to Bretherton (1991), secure base scripts can be viewed as the building blocks of the emergent experience-based mental structures that Bowlby (1973) called internal working models of attachment, a term he adopted from Craik (1943; see Bretherton & Munholland, 1999, 2008, for a discussion of Bowlby’s choice of this term). Bowlby (1973, 1980) believed that these models are quite stable and become increasingly resistant to change over time, which allows individuals to habituate to their social worlds (see also Main, Kaplan, & Cassidy, 1985). Indeed, if these models were to change easily, individuals would develop muddled and confused understandings of their social worlds— which would cause severe anxiety and psychological suffering—and the load on cognitive functioning would be overwhelming; see Bretherton & Munholland, 1999, 2008). Thus, for example, individuals who possess internal working models of their parents as secure bases and safe havens will be inclined to retain those models even when their parents sometimes fail to perform effectively in such roles (see Bretherton & Munholland, 2008). The notion that infants develop stable internal working models and that the contents of these models vary as a function of real-life events is supported by considerable data (for reviews, see Belsky & Fearon, 2008; De Wolff & van Ijzendoorn, 1997).

According to Bretherton and Munholland (1999, 2008), the idea that individuals possess internal working models of attachment meshes with broader research in cognitive neuroscience and social cognition. For example, Bowlby’s (1969/1982) early idea that mental “small-scale experiments” (p. 81) constitute internal working models of attachment is supported by Gallese’s (2005) more current proposition that premotor mirror neurons enable primate to understand others’ actions through “embodied simulation” (see Bretherton & Munholland, 2008, for a detailed analysis of the physiological underpinning of the internal working model construct). These theorists also have pointed out that the internal working model construct is, in general, consistent with both classical and contemporary theories of social cognition stating that
individuals develop internal representations of social experience; these theories include those proposed by Mead (1934; i.e., that individuals understand themselves and their worlds through their experiences of how others respond to their social bids), Lewin (1933; i.e., that people understand their environments subjectively through the personal meaning they derive from the ways in which their behaviors are elicited and responded to by environmental agents; see also Heider, 1958), and Baldwin (1995; i.e., that people develop interpersonal cognitive scripts of their transactional experiences with other persons; see also Dweck & London, 2004, Nelson & Gruendel, 1986, Schank & Abelson, 1977). Overall, the notion that internal working models develop and vary as a function of real-life attachment-related experiences is central to attachment theory and distinguishes it from other perspectives suggesting that infants mentally internalize their experiences with caregivers through other nonexperiential processes (e.g., unconscious fantasies; Freud, 1909/1999; Klein, 1932).

In developmental research, the knowledge contained in infants’ internal working models of attachment is most frequently inferred from observations during the 20-min laboratory Strange Situation procedure in which infants undergo a series of separation and reunion episodes with their attachment figure (Ainsworth, Blehar, Waters, & Wall, 1978). As Main et al. (1985) proposed, infant behavior, principally during the reunions, likely reflects the infant’s working model of attachment. Secure infants, for example, use their parent as both a safe haven and a secure base during the Strange Situation; they seek proximity to or interaction with their parents when stressed and/or frightened, derive comfort from such interaction, and reengage in exploration once they have been comforted. This behavior reflects internal working models of their parents as available, responsive, and sensitive to their attachment and exploratory needs (Ainsworth et al., 1978). In contrast, the behavior of insecure-avoidant infants who fail to seek proximity or interaction on reunion reflects an internal working model of their parents as consistently failing to provide a safe haven in times of need. The inability of insecure-resistant infants to derive comfort from their parents and to reengage successfully in exploration reflects an internal working model of their parents as unpredictable caregivers who should be kept nearby in order to increase the likelihood of gaining access to those attachment figures if needed (Cassidy & Berlin, 1994; Main, 1990). Unlike the secure and insecure children described above who appear to have an organized behavioral strategy for managing their attachment relationships (Main, 1990), some children appear to lack such a strategy and are classified as insecure-disorganized. These children engage in anomalous behavioral movements and postures, exhibit sequential or simultaneous displays of contradictory attachment behavior (e.g., strong avoidance coupled with strong proximity seeking), and/or show subtle and/or overt signs of being frightened by the parent (see Main & Solomon, 1986, 1990). Insecure-disorganized infants likely possess an internal working model of their parent as a source of danger, which leads them to behave in a frightened and/or disoriented manner (Hesse & Main, 2006; Main & Hesse, 1990).

The secure and insecure classifications assigned to children in the Strange Situation have been linked repeatedly to the quality of infants’ secure base and safe haven behaviors exhibited in the home (Ainsworth et al., 1978), as well as to the quality of parental caregiving received in the home context (e.g., parents of secure infants show more sensitivity to their infants than do parents of insecure infants; see Belsky & Fearon, 2008; DeWolff & van IJzendoorn, 1997; & Lyons-Ruth & Jacobvitz, 2008, for reviews); meta-analytic data also indicate that frightening maternal behavior is a principal contributor to infant disorganized (vs. organized) attachment (see Madigan et al., 2006). Although the Strange Situation is the predominant measure of attachment in infancy, other related laboratory measures of attachment in young children have been devised by Cassidy, Marvin, and the MacArthur Attachment Working Group (1992) and by Main and Cassidy (1988; see also E. Waters and Deane, 1985, for the Attachment Q-Sort). Moreover, for measures that provide windows into children’s representations of parent-related and/or dyadic child–parent-related knowledge, see Klagsbrun and Bowlby (1976; see also Kaplan, 1987, and Slough & Greenberg, 1990) for the Separation Anxiety Test and Bretherton, Ridgeway, and Cassidy (1990) for the Attachment Story Completion Task (Solomon & George, 2008, review these well-validated measures).

The quality of adolescents’ and adults’ internal working models of attachment is most often assessed with the Adult Attachment Interview (AAI; George, Kaplan, & Main, 1984, 1985, 1996) and the self-report Experiences in Close Relationships inventory (ECR; Brennan, Clark, & Shaver, 1998). These two measures are stable (see Bakermans-Kranenburg & van IJzendoorn, 1993, and Lopez & Gormley, 2002, for test–retest reliability data) and have overall excellent psychometric properties (especially with regard to discriminant validity; see Hesse, 2008, and Shaver & Mikulincer, 2004, for a review of the validity of these measures). Both measures are also thought to tap into the quality of individuals’ internal working models of attachment. Although the construct validity of each measure is strong, much data indicate that these two measures are statistically unrelated and essentially may assess different aspects of working models (see Roisman et al., 2007, for meta-analytic data; see also Roisman, 2009).

The AAI, for example, was designed by developmental psychologists to tap an individual’s current “state of mind with respect to attachment” (Hesse, 2008, p. 554) by asking interviewees to provide both general descriptions of their childhood relationships with their parents and specific memories in support of such descriptions. Individuals are also asked about attachment-related experiences during childhood, such as memories of being upset, ill, or hurt, and memories of separation, rejection, and loss (see Hesse, 1999, 2008, and Main, Hesse, & Goldwyn, 2008, for detailed descriptions of the AAI; see Hesse, 2008, for validity data). Using Main, Goldwyn, and Hesse’s (2008) classification system, coders rate each transcribed interview on a series of 9-point scales that reflect the inferred quality of the individual’s childhood experiences (e.g., having received loving parenting behavior) and the individual’s current state of mind with respect to attachment (e.g., coherence of mind). On the basis of an integrated consideration of both the inferred experience and state of mind scores, coders assign one of four principal attachments classifications to the transcript (see Hesse, 2008; see also Bakermans-Kranenburg & van IJzendoorn, 2009, for information about the distribution of these classifications across various samples). Individuals classified as secure-autonomous describe childhood experiences coherently, value attachment relationships, and consider attachment experiences as important to personal development. Individuals classified as insecure-dismissing either deny the impact that negative child-
hod experiences have on personal development or present a global portrait of a positive past while failing to provide specific supporting details. Individuals classified as insecure-preoccupied demonstrate an excessive, confused and/or passive, and unobjec-
tive (e.g., angry) preoccupation with attachment relationships and/or experiences. Individuals can also be classified as insecure-
unresolved if they show lapses in the monitoring of reasoning or discourse when discussing loss or trauma, but this classification rarely has been included in studies examining attachment-relevant social information processing. In some investigations, researchers have used a coding system based on the Main, Goldwyn, and Hesse (2008) classification system (i.e., Kobak’s, 1993, Attachment Interview Q-Sort) to code AAI transcripts on secure–insecure and dismissing–preoccupied dimensions.

The focus on the linguistic analysis of the coherence of the interview discourse is the hallmark feature of the AAI coding system and sets the AAI apart from methodologies aimed at assessing retrospective memories of personal experience. Moreover, the AAI is considered a principal measure in attachment research for two main reasons. First, the AAI has a striking association with parental caregiving behavior (meta-analytic data indicate a .72 effect size of the link between maternal AAI security to sensitive caregiving; van Ijzendoorn, 1995). Parents’ AAI class-
sifications are also concordant with infants’ Strange Situation classifications (i.e., secure–autonomous, insecure-dismissing, and insecure-preoccupied parents typically have infants classified as secure, insecure-avoidant, and insecure-resistant, respectively; meta-analytic data indicate a 75% concordance, [d = 1.06 effect size] between mothers’ AAI security–insecurity classification and infant Strange Situation security–insecurity classification; van Ijzendoorn, 1995). (Note that whereas the AAI is used with adolescents and adults, Target, Fonagy, Shmueli-Goetz, Datta, & Schneider, 1999, have recently developed a similar measure that assesses AAI-related representational processes during late childhood, i.e., the Child Attachment Interview; for validity data, see Shmueli-Goetz, Target, Fonagy, & Datta, 2008).

In contrast to the AAI, the ECR is a self-report measure of adolescents’ and adults’ attachment styles, or the stylistic attachment-related expectations, emotions, and behaviors that indi-
viduals exhibit in the context of close adult romantic relation-
ships (see Mikulincer & Shaver, 2007a, and Crowell, Fraley, & Shaver, 2008, for reviews and validity data; for a similar mea-
ture—the Adult Attachment Questionnaire, —see Simpson, Rholes, & Phillips, 1996). The ECR draws on two attachment-
related dimensions—attachment avoidance and attachment anxiety. Attachment avoidance refers to an unwillingness to go to close others for comfort and support, and attachment anxiety, in contrast, refers to the fear of losing others or being abandoned by them. Individuals who display a secure attachment style have relatively little attachment-related anxiety or avoidance. Some attachment theorists believe that individuals’ attachment styles may emerge from their childhood attachment experiences, and research has shown that adults with insecure attachment styles, compared with those with secure attachment styles, provide more negative retrospective reports of their childhood attachment relationships (see Mikulincer & Shaver, 2007a, for a review). Some commonly used attachment style measures use attachment anxiety- and avoidance-
related scales to derive attachment categories (e.g., Bartholomew & Horowitz, 1991; Hazan & Shaver, 1987, 1990; see also Griffin & Bartholomew, 1994; see Crowell et al., 2008, for information about the validity of these measures). For example, Hazan and Shaver’s measure yields three attachment groups (secure, avoidant, and ambivalent-anxious/resistant), and Bartholomew and Horowitz’s Relationship Questionnaire adds a fourth (fearful). It is again important to note that although these attachment style class-
sifications appear similar to AAI classifications, meta-analytic data indicate that there is trivial to small overlap between these mea-
sures (i.e., between AAI security–insecurity and self-reported security, between AAI dismissing state of mind and self-reported avoidance, between AAI preoccupied state of mind and self-
reported anxiety/ambivalence, and between the AAI unresolved classification and self-reported fearfulness; see Roisman et al., 2007).

Finally, social psychologists have recently devised innovative methodologies to prime adults’ attachment security using supra-
liminal and/or subliminal priming techniques (see Mikulincer & Shaver, 2007c; Shaver & Mikulincer, 2002). These methodologies differ from interview and self-report measures of attachment in that they do not tap the quality of adults’ dispositional internal working models of attachment. Instead, adults are exposed to a priming stimulus (e.g., positive attachment-related words) and such words are expected to activate (to some extent) the positive attachment-related knowledge contained in internal working mod-
els of attachment. The activation of this knowledge is thought to implicitly promote security within the individual temporarily.

A Model of Attachment and Social Information Processing

At their core, internal working models of attachment are mental structures that are conceived of as playing a role in the processing of attachment-relevant social information. As alluded to earlier, one basic function of these models is thought to be that of storing attachment-related knowledge (e.g., knowledge about past experi-
ences with attachment figures; Bowlby, 1973; see also Delius, Bovenschen, & Spangler, 2008, for recent cross-sectional data indicating that some aspects of children’s attachment-related knowledge increase with age). Another important function is the generation of expectations (i.e., predictions) regarding how attach-
ment figures will behave in subsequent interactions (Bowlby, 1973; Collins & Allard, 2004; Thompson, 2006); these predictions are useful because they calibrate the attachment behavioral system so that it corresponds to the (probable) type of care to be received from the parent (e.g., a child who has stored information about his mother’s repeated sensitivity toward him will expect his mother to be sensitive in future interactions). This notion is consistent with a variety of theories claiming that individuals rely on existing cogni-
tive structures in coming to understand new information (e.g., Crick & Dodge, 1994; Holmes, 2002; Piaget, 1954). As individ-
uals acquire more advanced cognitive capacities, internal working models of attachment will also perform other important functions related to social information processing, such as providing indi-
viduals with information—or perhaps misinformation—about the self (Bowlby, 1973). For example, beginning early in life, children begin to understand whether they are accepted or unaccepted by attachment figures. Such knowledge will contribute to either a representation of the self as a person who is meant to be loved and valued by others or a representation of the self as a person who is
not meant to be loved or valued (Bowlby, 1973; see also Fonagy, Gergely, & Target, 2007, for theory and a review of research about how attachment experiences shape children’s construction of self).

Perhaps most centrally, internal working models of attachment are thought to function to influence the ways in which individuals obtain, organize, and operate on attachment-relevant social information (Bowlby, 1980). As Main et al. (1985) noted, internal working models provide individuals with both conscious and unconscious rules “for the direction and organization of attention and memory, rules that permit or limit the individual’s access to certain forms of knowledge regarding the self, the attachment figure, and the relationship between the self and the attachment figure” (p. 77; see also Egeland & Carlson, 2004). As such, individuals are likely to use different (i.e., biased) rules to process attachment-relevant social information as a function of whether they have a secure or an insecure internal working model of attachment. Indeed, understanding these information processing biases has become a major focus among attachment theorists (initially by Suess, Grossmann, & Sroufe, 1992) and relates to psychologists’ more general interests in understanding biased social information processing (Crick & Dodge, 1994; Lemerie & Arsenio, 2000). Moreover, this intriguing idea that individuals follow biased rules to process social information is in agreement with the widespread notion that individuals are—not necessarily conscious—active agents in their own development, processing information selectively (e.g., by orienting mental awareness toward or away from social stimuli) in order to understand past and ongoing social experiences and to shape future ones (e.g., Piaget, 1954; Scarr & McCartney, 1983). Put another way, internal working models of attachment can be perceived as representational bridges that mediate—through a variety of information processing mechanisms—longitudinal links between early experience and later adaptation (see Dweck & London, 2004; Thompson, 2008).

If individuals are biased and use different rules to process social information as a function of their internal working models of attachment, these rules are likely manifested in different ways as a function of the type of attachment-relevant social information that an individual is required to process. One important dimension on which attachment-relevant social information can vary relates to its potential for causing psychological pain. According to Bowlby (1980), insecure individuals are expected to use these rules to filter out (from conscious awareness) attachment-relevant social information that would cause excessive emotional pain; secure individuals, in contrast, are not expected to use such rules to process potentially pain-inducing information. These differences are expected to emerge because insecure individuals are less likely to have had experiences with an attachment figure in which painful emotions were understood and responded to (Cassidy & Kobak, 1988; Mikulincer, Shaver, Cassidy, & Berant, 2009). For example, referring to the work of Gill (1970), Bowlby (1988) remarked that children’s abilities to process social information is influenced in large part by parents’ abilities—and inabilities—to discuss difficult emotions in the presence of their children.

Yet there are times when individuals are expected to process information in a schema-driven manner so that this information can be processed rapidly and efficiently (Bowlby, 1973; Bretherton & Munholland, 1999). It is further expected that schema-driven information processing will occur when the processing of attachment-relevant social information does not potentially involve the experience of psychological pain. Thus, secure individuals would process information in a positively biased fashion and insecure individuals would process information in a negatively biased fashion—in both cases—as a function of their experience-based internal working models of attachment. We discuss these ideas in greater detail below.

**An information processing approach to defense.** Bowlby (1980) drew on the work of previous theorists and cognitive scientists (most notably Erdelyi, 1974, and Peterfreund, 1971) in developing what he called “an information processing approach to defence” (p. 44). Bowlby posited that when an individual is presented with attachment-relevant social information that “when accepted previously [for processing has] led to suffering” (p. 73), his or her internal working models function to provide a defense from this information. Thus, if an individual has experienced distress when his or her attachment system has been activated in the past (e.g., during times in which he or she sought care from a parent but was rejected), these models could function to protect the individual from reexperiencing such distress by limiting access to attachment-relevant social information that might activate the attachment system (Bowlby, 1980). Interestingly, although these protective patterns most likely emerge when individuals process potentially painful negative attachment-relevant social information (e.g., information about the absence of attachment figures when needed), they also likely emerge when individuals process potentially painful positive social information (i.e., information about events in which an attachment figure served as a secure base). For example, an individual may filter out from conscious awareness information about an attachment figure serving as a secure base because thinking about such information may lead the individual to recall that he or she has experienced few—if any—actual secure base experiences with that figure. The idea that individuals can protect themselves from experiencing psychological pain by filtering out social information is long-standing in attachment theory (Bowlby, 1980; see also Fearon & Mansell, 2001; Fraley, Davis, & Shaver, 1998; Main, 2000; Mikulincer et al., 2009; Thompson, 2008) as well as in the field of psychology more broadly (e.g., Freud, 1915/1957; Joffe & Sandler, 1965; Thornhill & Thornhill, 1989) and in the clinical literature on dissociation and posttraumatic stress disorder (e.g., Putnam, 1997).

Bowlby (1980) used the term *defensive exclusion* when referring to the capacity to process information in ways that prohibit potentially painful information from entering conscious awareness. He described two main forms of defensive exclusion that may look quite different from each other, yet share the common outcomes of halting or diverting information processing. Such outcomes are effectively adaptive because they protect the individual from psychological pain associated with the conscious processing of information that may be linked to stored mental knowledge that one’s previous attachment needs have gone unmet.

Bowlby (1980) proposed that one form of defensive exclusion—deactivation—occurs when internal working models of attachment function to partially or completely deactivate information from further processing by turning the individual’s attention away from or limiting memory for attachment-relevant social information. However, if this information cannot be completely excluded from conscious awareness (e.g., because a person is being asked directly about a specific incident), internal working models of attachment may alternately function to help individuals cope with the affec-
tively laden content of this information through cognitive suppression. Thus, individuals are able to halt the conscious cognitive processing of the information’s emotional components that could cause psychological distress and instead divert the processing to the information’s more rote and emotionally neutral aspects (e.g., the context in which the social information was obtained). Therefore, an insecure individual might be able to remember a negative attachment-related experience but not remember the full extent of the emotions experienced during the event because the insecure internal working models have filtered from conscious awareness any emotional (positive and/or negative) content that could cause psychological pain. Bowlby (1980) also identified a second form of defensive exclusion: “cognitive disconnection of response from situation” (p. 67). This form of exclusion occurs when an individual shifts attention away from the true source of distress and mistakenly identifies another person (including the self) or situation as the cause of the distress. This strategy results in replacing one form of distress with another.

If attachment insecurity is associated with defensive exclusion, through what developmental pathways might attachment security come to be associated with the capacity to process painful experiences without engaging in defensive exclusion? Representations of others as available and responsive and of the self as capable of eliciting care contained in secure working models of attachment could contribute to confidence that distressing emotions are tolerable (i.e., that distressing emotions can be recognized, acknowledged, accepted, and recovered from rather than having to be denied or avoided). In addition, these representations could guide individuals to seek soothing when distressed and, through the repetition of experiences of being soothed, the child could develop capacities for competent self-soothing (Fonagy et al., 2007; Sroufe, Egeland, Carlson, & Collins, 2005). The quality of the child’s attachment and the corresponding internal representations can be viewed as providing the context in which the child comes to understand and organize his or her responses to distress. For the child who interacts with a parent sensitive to his or her signals, emotions will be experienced as useful in alerting the parent during times of distress. Sensitive parental response, in turn, will enhance the child’s sense of efficacy in modulating his or her distress responses (Bell & Ainsworth, 1972). In this type of dyad, the child’s experience of distressing emotions, such as fear and anger, comes to be associated with expectations of ameliorative parental response. As a result, the experience of distressing emotions may be less threatening to the child. The experience of security is not based on the denial of distress but on the ability to temporarily tolerate distress in order to achieve mastery over threatening or frustrating situations (Cassidy & Kobak, 1988). In sum, it is reasonable to assume that most individuals, regardless of attachment security, will exclude from processing information that is too painful to tolerate. Secure people may attend to more painful information before they reach the point that they need to exclude it because of experiences with supportive others who have helped them gain capacities for tolerating painful feelings (see Master et al., 2009, for evidence of physical pain reduction in women both while holding the hand of a male romantic partner and while looking at his photograph). It is also likely that heritable factors contribute to the tolerance of psychological pain, as is the case with physical pain (Edwards, 2006), and that these factors interact with attachment security.

These tendencies of secure individuals to process potentially psychologically painful information in a cognitively open manner and of insecure individuals, in contrast, to engage in defensive exclusion to block psychological pain from conscious awareness are thought to be evident from infancy through adulthood. As one example, we describe in the section below the ways in which these attachment-related differences in social information processing are evident in adults’ AAI transcripts.

Information processing strategies evident in the Adult Attachment Interview. Although generally conceived of as providing information about an individual’s state of mind with respect to attachment (George et al., 1984, 1985, 1996; Hesse, 1999, 2008; Main, Goldwyn, & Hesse, 2008), AAI interviews can also be viewed as providing a window into the individual’s attachment-related information processing strategies (see Kobak & Cole, 1994; Main, 2000; Main, Goldwyn, & Hesse, 2008), and we present examples related to three of the AAI patterns. AAI interviewees classified as secure-autonomous demonstrate the capacity to process openly attachment-relevant social information because they can attend to questions regarding their attachment experiences, provide autobiographical (i.e., semantic and episodic) memories that support their general descriptions of their attachment relationships, and explore freely (in a thorough and coherent manner) thoughts and feelings related to both the positive and negative aspects of their attachment experiences (Hesse, 1999, 2008; see also Tulving, 1972). For some individuals, a secure state of mind could stem from positive attachment-related experiences with caregivers (i.e., experiences in which they were able to use their attachment figure successfully as both a secure base and a safe haven; Beckwith, Cohen, & Hamilton, 1999; Hamilton, 2000; Main, Hesse, & Kaplan, 2005; Sroufe et al., 2005; E. Waters, Merrick, Treboux, Crowell, & Albersheim, 2000). For other individuals, a secure state of mind may not stem from positive attachment-related experiences with caregivers because these individuals state that such experiences did not occur (i.e., they describe experiences indicating that they were not able to use their attachment figures as either a secure base or a safe haven during their lives; Pearson, Cohn, Cowan, & Cowan, 1994). Instead, these individuals (who are classified as “earned secure” in the AAI) demonstrate a capacity to think about and discuss their negative attachment-related childhood experiences coherently and thoughtfully without engaging in information processing strategies that serve to exclude the processing of painful childhood attachment-related experiences. Such individuals also value and appreciate attachment relationships, despite personal claims that these relationships were unfulfilling in their own childhoods (see Hesse, 1999, 2008).

In contrast, AAI interviewees classified as having an insecure state of mind with respect to attachment show defensive exclusion when discussing their childhood attachment experiences (i.e., they have difficulties answering questions about their childhood attachment experiences in an open, thoughtful, and coherent manner). For example, when asked specific questions about their parents, dismissing individuals may give a global impression that their relationships with their parents were generally positive (or even perfect) while failing to provide specific memories that support such positive and/or idealized perceptions; at times, these individuals seem unaware that the specific memories they provide contradict the positive global descriptions. Other individuals in this
group describe their attachment experiences as highly negative yet claim that these experiences had little or no negative effect on their personal development. An insecure-dismissing state of mind may emerge when individuals’ internal working models of attachment are limiting access to attachment memories that are emotionally difficult and painful, possibly because these individuals have experienced considerable rejection, insensitivity, and/or lack of love in relationships with their own parents (see Cassidy & Kobak, 1988; Hesse, 1999, 2008). Indeed, experimental evidence of suppression of negative attachment-relevant information comes from studies in which insecure-dismissing adults showed increased electrodermal activity (considered to be an indicator of the effortful suppression of negative emotion) when thinking about potentially painful attachment-related experiences (Dozier & Kobak, 1992; Roisman, Tsai, & Chiang, 2004).

It is easy to understand how insecure-dismissing attachment, with its characteristic denial of distress, functions to shut out psychological pain. It is less obvious that the heightened negative emotionality characteristic of insecure-preoccupied individuals might also serve to shut out pain. These individuals provide answers to questions about their childhood attachment experiences, yet their answers contain components of anger, one-sidedness, passivity, fear, and/or confusion (Hesse, 1999, 2008). For example, these individuals shift attention away from the focus of a question and instead show (off-topic) angry and confused preoccupation with particular aspects of their childhood experiences (e.g., by attending excessively to the details of childhood memories that have angered them). Such shifts in attention both prevent participation in a collaborative, focused interview and interfere with the sort of reflection necessary to objectively assess the nature of the childhood attachment experiences. Cassidy and her colleagues (Cassidy, 2005; Dykas & Cassidy, 2007; Mikulincer, Shaver, Cassidy, & Berant, 2009) have proposed that this pattern of behavior may emerge because these individuals’ internal working models of attachment serve to divert attention away from genuine hurtful memories of parental insensitivity and redirect attention to memories that are not as emotionally damaging or hurtful. This pattern evident in the AAI is also congruent with Bowlby’s (1980) clinically identified form of defensive exclusion characterized by “the redirection of responses away from the person arousing them” and “preoccupation with personal reactions and sufferings” (p. 68). In keeping with this proposition, recent research from the self-report literature has indicated that heightened negative emotionality (in the form of worry) is associated with a tendency to avoid or control internal experiences rather than accept them (Roemer, Salters, Raffa, & Orsillo, 2005) and has shown that such negative emotionality actually does prevent effective processing of painful emotions (Borkovec, Alcaine, & Behar, 2004; see also Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). Fosha (2000) has observed clinically that the exaggerated emotional expression characteristic of preoccupied individuals can be a “defense against genuine emotion” (p. 118).

Schema-driven social information processing. Of course, not all attachment-relevant social information is potentially pain-inducing. When an individual is presented with information that can be processed without risk of psychological pain, it is reasonable to believe that internal working models of attachment instigate less effortful, nondefensive information processing functions. More precisely, as others have noted, internal working models could function to process this information schematically, in ways that are consistent with previously obtained attachment-related knowledge (e.g., information related to the availability, responsiveness, and sensitivity of attachment figures; see Bretherton & Munholland, 1999, 2008). According to this thinking (Bretherton & Munholland, 1999), insecure individuals will process this attachment-relevant social information in a negatively biased schematic fashion (drawing on negative experiences with attachment figures); secure individuals, in contrast, will be more likely to process this information in a positively biased schematic fashion (because they are more likely to have had positive experiences with attachment figures on which to draw). We note that although Bowlby did not use the term schematic (or similar terminologies) when discussing this particular information processing pathway, he clearly suggested a conceptual link between individuals’ internal working models of attachment and their tendencies to perceive their worlds in a positive light if they possessed positive attachment-related knowledge or in a negative light if such knowledge was negative (e.g., Bowlby, 1973).

The belief that individuals process certain types of attachment-relevant social information in a schematic fashion is based on the notion that internal working models of attachment function to process social information in the most rapid and efficient ways possible (Bowlby, 1973; Bretherton & Munholland, 1999, 2008; see also Baldwin, 1992). By tapping into experience-based knowledge, internal working models of attachment provide individuals with the capacity to interpret and evaluate attachment-relevant social information relatively quickly, a capacity that is highly adaptive for individuals considering that such interpretations and evaluations often need to be made in real-time. Moreover, it is efficient for individuals to draw on stored knowledge when processing new information so that they do not have to spend valuable time (and limited mental resources) processing this information from scratch (see Bowlby, 1973; Bretherton & Munholland, 1999). Indeed, the notion that individuals engage in schema-driven information processing is not new, and individuals are believed to process many other types of social information in a schematic fashion (e.g., according to gender schema theory, individuals acquire stereotypical information about gender roles and use this knowledge schematically when interpreting and evaluating new gender-related information; Bem, 1981, 1985).

A note about generalization. Although internal working models are thought to function principally to assist in the processing of social information related directly to attachment (Ainsworth, 1989; Bowlby, 1973, 1980), these models likely also have considerable influence over how individuals process social information that is unrelated to attachment (Mikulincer & Shaver, 2007c; Sroufe, 1988; Suess et al., 1992). This argument stems from Bowlby’s (1973) claim that attachment experiences, and the internal working models forged from them, generalize to influence behavior and relationships with other persons. Thus, in the absence of considerable information about other persons, individuals will use knowledge about people they do know (by tapping into their internal working models of attachment) to understand their interactions with these unfamiliar people. (Note again that this proposition meshes with a widespread notion held by developmentalists that individuals use existing cognitive structures in coming to understand new information; Piaget, 1954; see also Dweck & London, 2004). Moreover, the rules that internal working models
employ to process attachment-relevant information (seen in the AAI, for example) likely generalize to process these new types of social information (e.g., individuals classified as secure on the AAI and who show nondefensive access to attachment-related information will not likely suppress new information related to peers and other persons). There are many factors to consider when delineating the extent to which internal working models of attachment should guide the processing of social information that is not related directly to attachment (Belsky & Cassidy, 1994; Berlin & Cassidy, 1999). Yet, there is growing evidence (reviewed later in this article) that these models are associated with the processing of social information related to peers, romantic partners, and strangers.

Summary

Bowlby (1973, 1980) proposed that individuals develop experience-based internal working models of attachment that contain knowledge about both attachment figures and the self and that aid extensively in the processing of attachment-relevant social information across the life span. Individuals who possess secure internal working models will process a broad range of positive and negative attachment-relevant social information relatively fully, and information processing that draws on existing schema will tend to be positively biased in ways congruent with their generally positive experienced-based attachment-related knowledge (Bowlby, 1969/1982; Mikulincer & Shaver, 2005; Pietromonaco & Barrett, 2000). In contrast, individuals who possess insecure internal working models will process attachment-relevant social information in one of two ways, depending on whether the information could cause the individual psychological pain. If processing the information could lead to psychological pain, insecure individuals will defensively exclude or suppress this information from further processing. If, however, the information in unlikely to be painful, then insecure individuals will process this information in a negatively biased schematic fashion (that is congruent with their negative experienced-based attachment-related knowledge).

In the next section, we provide a detailed and comprehensive review of the literature that reveals these attachment-related social information processing patterns.

Review of the Empirical Literature

In this four-part section, we review the empirical literature on relations between attachment and the processing of social information. We begin by examining these relations in three developmental periods: childhood, adolescence, and adulthood. In the final part, we examine intergenerational links between attachment and social information processing in parents and their children. Using Bowlby’s (1973, 1980) theorizing described above, we explain how this literature meshes with the notions of secure versus insecure patterns of attachment-relevant social information processing, more precisely, the secure pattern of relatively open and positively biased schematic processing versus the insecure pattern of exclusion or suppression and negatively biased schematic processing. Moreover, to explain the different ways in which these patterns are manifested across the life span, we organize our review by focusing on a variety of studies (e.g., experimental studies, correlational studies, longitudinal studies) that have examined specific components (e.g., attention and memory) and broader aspects (e.g., perceptions of and attributions about other persons, feedback seeking, secure base scripts, theory of mind, and emotional understanding) of social information processing.

Attachment and the Processing of Social Information in Childhood

Attachment and children’s attention to social information. Several studies have examined whether attachment is linked to children’s attention to attachment-relevant social information. Johnson and her colleagues (Johnson, Dweck, & Chen, 2007; Johnson et al., 2010), for example, have recently examined these links using visual habituation paradigms. In an initial experiment and a replication, these researchers examined 12- to 16-month-old infants’ attention to responsive and unresponsive computer animated mother–child scenarios. This experiment began with a series of habituation trials in which infant participants viewed a mother (larger) ellipse appearing with a child (smaller) ellipse at the bottom of a steep incline. The mother ellipse then traveled halfway up the incline to a plateau and stopped, and the child ellipse protested the separation (i.e., by bouncing and pulsating). Infant participants viewed this sequence repeatedly until they no longer looked at it (which indicated that they were fully habituated to the animated mother–infant separation). Then, after viewing these habituation trials, infants viewed either a reunion episode (i.e., the mother ellipse returning responsively to the distressed child ellipse) or an increased separation episode (i.e., the mother ellipse not responding to the distressed child ellipse but instead moving farther away).

As expected, in both the initial experiment and the replication, infant participants’ Strange Situation classifications were linked to their looking times at the reunion and separation episodes: Secure infants looked longer at the increased separation/unresponsive episode than at the reunion/responsive episode, whereas the opposite pattern emerged for insecure infants. These data supported the researchers’ hypothesis that secure infants, compared with insecure infants, would attend longer to the unresponsive caregiver stimulus because it is not congruent with secure infants’ working models of attachment of the caregiver as responsive and is thus more unexpected. As such, these findings can be viewed as an example of schema-driven processing. These findings are also consistent with the notion presented in this article that insecure infants suppress their attention to distressing infant–mother attachment-related information, whereas secure infants can process such information openly by attending to it. (See Johnson et al., 2010, for findings from a study using a similar habituation paradigm that revealed expected links between infant attachment in the Strange Situation and infant attention to animated “infant” behavior on reunion with an animated “mother.”)

Evidence of suppression-related attentional processes has emerged from longitudinal studies of older children. Main et al. (1985), for example, reported that 6-year-old children who had been classified as insecurely attached to mother in the Strange Situation during infancy showed greater difficulty attending to family photographs than did secure children. Insecure-avoidant children avoided these photographs (e.g., by actively turning away from them), whereas insecure-disorganized children tended to show a disorganized pattern of attention (e.g., by focusing exces-
sively on the picture for a relatively long period of time without attending to the experimenter’s queries). In another study, Kirsh and Cassidy (1997) reported longitudinal links between infant attachment (as assessed with the Strange Situation) and young children’s later attentional biases for attachment-relevant information (as assessed with recorded eye movements). In one task, 3.5-year-old children were presented with three drawings of a child–mother dyad. In one drawing, the dyad was engaging in an affectively positive interaction, and in the other two drawings, the dyad was engaging in either an affectively neutral or a negative interaction. The investigators reported that children classified as insecure-avoidant in infancy looked away from all three drawings proportionately longer than children classified as either secure or insecure-ambivalent. In another task, the children viewed eight sets of complementary drawings. In each set, one drawing was attachment related (i.e., child–mother dyad engaging in a positive interaction and displaying positive affect), whereas the other drawing was not attachment related (i.e., a pair of noninteracting adults). In one analysis, the researchers calculated the amount of time participants looked at each drawing as a proportion of the amount of time looking at both drawings; as expected, insecure children looked at the attachment-relevant drawings significantly less than did their secure counterparts.

In contrast, Belsky, Spritz, and Crnic (1996) failed to find longitudinal links between infants’ Strange Situation classifications and 3.5-year-olds’ attention to puppet shows containing both positive and negative social events; however, these nonsignificant findings might have emerged because the measure of attention was based on participants’ vulnerability to distraction (i.e., researchers coded children’s facial expression for momentary distraction when a clicking sound accompanied the presentation of a positive or a negative social event). Indeed, children might have habituated to the repeated administration of a clicking sound during the experiment, which might have made this measure of attention ineffective.

**Attachment and children’s memory for social information.**

The available data indicate that attachment is associated with children’s memory for social information. Two studies, for example, have reported longitudinal connections between infant attachment insecurity (as assessed with the Strange Situation) and young children’s impaired memory for social events involving close others. Interestingly, however, these studies suggested that insecure children suppress attachment-relevant social information in some cases and process it in a negatively biased schematic manner in others, whereas secure children show openness to remembering a range of positive and negative emotions. In one study, Kirsh and Cassidy (1997) asked children to listen to and recall information from six stories about a child’s bid for care from his or her mother following a minor injury. In these stories, mothers were responsive and sensitive to the child’s bid, rejecting of the child’s bid, or self-involved following the child’s injury. After controlling for general cognitive functioning, results consistent with the notion of suppression showed that compared with their secure counterparts, children with insecure-avoidant attachment histories had poorer memory for the responsive/sensitive stories, and children with insecure-ambivalent attachment histories showed poorer memory for the rejecting stories. In the other longitudinal study (Belsky et al., 1996), children viewed two puppet shows that contained a series of positive and negative social events. After viewing the puppet shows, children were presented with a pair of drawings that reflected each of the positive and negative events that occurred in the puppet show, but only one of each pair depicted the event as it actually occurred. Consistent with the notion of schematic information processing were data indicating that children classified as secure in infancy remembered the positive social events more accurately than the negative events, whereas children classified as insecure in infancy remembered the negative social events more accurately than the positive events. Unexpectedly, in another longitudinal study, Ziv, Oppenheim, and Sagi-Schwartz (2004) did not find connections between infants’ Strange Situation classifications and older children’s memory for videotaped mother–peer-related social events in middle childhood; however, the failure to find such links could be attributed to the memory measure used (i.e., researchers simply asked participants to tell them “what happened” in the viewed interactions, a procedure that may not have served as a sufficiently structured memory prompt).

**Attachment and children’s perceptions and attributions.**

Several studies of children’s perceptions and attributions lend support to the claim that children perceive others in a schematically biased manner as a function of attachment. In an early contemporaneous study, Cassidy (1988) reported that insecurity at 6 years of age (assessed with the Main and Cassidy system) was linked to perceptions of low peer acceptance. With respect to attributions, Susser et al. (1992) reported longitudinal data indicating that 5-year-old children who had been classified as insecure as infants in the Strange Situation were less likely than children who had been classified as secure to attribute positive intentions to peer behavior in social conflict situations. Similarly, Ziv et al. (2004) found that 7.5-year-old children’s infant Strange Situation classifications were connected longitudinally to the attributions that they generated in response to a videotaped peer-group entry script (i.e., a script portraying a child who attempts to play with two peers but is responded to either aggressively, nonaggressively, or ambiguously; see Dodge & Price, 1994). Secure children processed the social information by properly attributing the nonaggressive responses to positive motives and the aggressive responses to negative motives. In contrast, insecure children showed less flexible and more negative attributions (e.g., attributing both the aggressive and nonaggressive responses to negative motives). Raikes and Thompson (2008) also reported that toddler attachment insecurity (assessed with the Strange Situation at multiple time points between the ages of 15 months and 36 months in the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development) was linked to hostile attribution biases of ambiguous peer behavior at first grade (see also Elicker, Englund, & Sroufe, 1992, for similar longitudinal evidence). Interestingly, Raikes and Thompson did not find a link between attachment and peer attributions at an earlier age (4.5 years of age; see also Cassidy, Kirsh, Scolton, & Parke, 1996, for similar null results with preschoolers). In a study of older children, however, Cassidy et al. (1996) reported contemporaneous links between attachment and children’s attributions of hypothetical stories in which a peer clearly caused something negative to happen to the child, but the circumstances and the peer’s intent were ambiguous (stories based on the work of Dodge & Frame, 1982). More specifically, kindergarten and first-grade children classified as insecure (with the Main & Cassidy, 1988, classification system) were more likely than their secure counterparts to
have negative perceptions of the peer’s feelings and to attribute the peer’s behavior to more negative underlying intentions and motives.

**Attachment and children’s secure base scripts.** From a schematic information processing perspective, securely attached individuals should be capable of drawing on their positive attachment-related knowledge (i.e., their secure base scripts) to create attachment-related “stories” in which a person can successfully use another person as a secure base from which to explore and as a safe haven to which to return in time of need and/or distress (see H. S. Waters et al., 1998). H. S. Waters et al. (1998) tested this hypothesis by examining children’s responses to an attachment-related story completion task (Bretherton et al., 1990).

In this task, children were given the beginning of a story and were instructed to describe how the story would end (e.g., participants were asked to finish a story in which a child is rock climbing with his parents and hurts his knee). Children classified as insecure at 25 months of age (assessed with the observer-completed Attachment Q-Sort) were less likely than other children to create stories involving knowledge of and access to secure base scripts at ages 37 and 54 months. For example, the stories of insecure children contained child protagonists who failed to turn to and/or be comforted by an attachment figure when distressed.

**Attachment, children’s theory of mind, and emotional understanding.** Researchers have shown considerable interest in understanding whether attachment is linked to children’s theory of mind and emotional understanding. Theory of mind refers to a person’s knowledge that other individuals’ mental states are independent from his or her own, as well as the capacity to understand that mental states influence behavior (e.g., by explaining how a person’s behavior is motivated by independent knowledge, desires, and/or perceptions; see Wellman, 1990). The most frequent tool used to assess children’s theory of mind performance has been the false-belief task, in which children are presented with a situation in which they must predict the behavior of an actor on the basis of the actor’s perceived mental state (see Wellman, Cross, & Watson, 2001, and Wimmer & Perner, 1983, for detailed descriptions of this task).

Attachment theorists have hypothesized that insecurely attached children should demonstrate poorer theory of mind performance than secure children because their negative attachment-related experiences should lead them to have difficulties processing the feeling states of other persons thoughtfully and systematically (cf. Bretherton, 1990; Main, 1991). Moreover, Fonagy and his colleagues (Fonagy, Gergely, Jurist, & Target, 2002; Fonagy, Steele, Steele, Moran, & Higgitt, 1991; Fonagy & Target, 1997) have suggested that insecure children should have a less well developed capacity for “reflective functioning,” a term used to describe the “psychological processes underlying the capacity to perceive and understand oneself and others’ behavior in terms of mental states” (Fonagy, Steele, Steele, & Target, 1997, p. 5; see also Fonagy et al., 2007). Essentially, insecure children should struggle in both “reading” the minds of others and in understanding others’ behaviors as meaningful and predictable (Slade, 1999).

As predicted, links have emerged between attachment and children’s theory of mind performance. Using the Strange Situation, for example, researchers have reported longitudinal evidence that children with insecure infant attachment histories have poorer theory of mind than their secure counterparts (McElwain & Vol-
Similarly, H. Steele, Steele, Croft, and Fonagy (1999) used an emotion understanding task to tap 6-year-old children’s perceptions of individuals’ responses to social and emotional dilemmas. Compared with their secure counterparts, children classified as insecure (in the Strange Situation at age 1 year) were less likely (a) to appropriately identify which facial expressions individuals would express in these dilemmas and (b) to justify why such expressions would be warranted (see also Greig & Howe, 2001, for contemporaneous data linking attachment—as assessed with the Attachment Story Completion Task—and children’s perceptions of affective responses to emotional events). Relatedly, using the observer-rated Attachment Q-Sort to assess attachment, Thompson and his colleagues (Raikes & Thompson, 2006, 2008) have reported a variety of contemporaneous and longitudinal data indicating that insecurely attached children compared with secure children show poorer emotional understanding of themselves and others and difficulties identifying socially competent solutions to peer-related social problem-solving tasks.

Attachment and the Processing of Social Information in Adolescence

Attachment and adolescents’ attention to social information. Cassidy, Ziv, Mehta, and Feeney (2003) have been the only researchers to examine links between attachment and adolescents’ attention to social information. In this study, they used a feedback seeking paradigm to examine adolescents’ explicit decisions about the type of information from peers to which they wanted to attend. Eleventh-grade participants were informed that students from another school would be asked six questions about them and that “because of time” the participants could view the responses to only three of the six questions. Three of the questions conveyed the impression that the participant would receive positive feedback (e.g., “Why might this person be happy with himself or herself most of the time?”). The other three questions suggested that the participant would receive negative feedback (e.g., “Why would this person often wish he or she was different?”). As expected, between-groups analyses indicated that more secure adolescents (as assessed with a security composite score derived from the ECR) sought more positive feedback about the self as a worthwhile person than did less secure adolescents. Moreover, within-group analyses indicated that more secure adolescents sought significantly more positive feedback than expected by chance, demonstrating positively biased schematic processing; no within-group findings emerged for insecure adolescents. Interestingly, mediation analyses indicated that adolescents’ degree of global self-worth mediated the link between attachment style and adolescent feedback seeking.

Attachment and adolescents’ memory for social information. Four studies have examined links between attachment and adolescents’ memory for social information. Three of these studies (Dykas, Woodhouse, Ehrlich, & Cassidy, 2010; Feeney & Cassidy, 2003) used the same sample to examine whether adolescents reconstructed their memory for short 10-min adolescent–parent laboratory conflict interactions over time as a function of attachment. These investigators assessed memory by having adolescents rate their perceptions of the laboratory conflicts immediately following the interaction and again 6 weeks later. The results from these studies lend support to the notion that over time, when the memory for specific attachment-related events degrades, adolescents tap into their internal working models of attachment schematically to reconstruct their memory for that event. More precisely, using the AAI to assess attachment, Dykas et al. reported that secure adolescents reconstructed interactions with each parent more favorably over the 6-week period, whereas insecure adolescents showed less favorable reconstructive memory over the same amount of time. Adolescents’ memory for these interactions was also associated with observational ratings in theoretically interesting ways (e.g., secure adolescents had an initial bias to perceive their interactions with both mothers and fathers as less negative than observed ratings, and this bias grew stronger over time; however, insecure adolescents’ ratings did not change over time in relation to the observers’ ratings). Moreover, using a battery of self-report measures to tap attachment-related representations of parents, Feeney and Cassidy reported results from two (initial and replication) studies indicating that when adolescents’ attachment-related self-reported perceptions of the parent were more negative, adolescents were more likely to remember the discussion as less positive and more negative than they had reported 6 weeks earlier.

In another study with the same sample, Dykas and Cassidy (2010) used the AAI to assess attachment security and a methodology devised by Mikulincer and Orbach (1995; Childhood Memory Task) to assess adolescents’ memory for emotionally salient childhood events. Adolescents recalled four emotionally significant memories from childhood and then rated the emotional intensity of these memories. Evidence of suppression emerged such that insecure adolescents (i.e., insecure-dismissing and insecure-preoccupied groups combined) retrieved emotionally significant childhood memories more slowly than did secure adolescents.

Attachment and adolescents’ perceptions, expectations, and attributions. The available data indicate that insecure adolescents perceive and generate expectations and attributions about others in a negatively biased schematic manner, whereas their secure counterparts process such information in a positively biased schematic manner. For example, Dykas, Cassidy, and Woodhouse (2009) reported that lower AAI coherence of mind was linked to greater expectations of rejection by others. In several other studies that used the AAI, researchers reported that compared with secure adolescents, insecure adolescents were more likely to have insecure working models of peers (and, if classified as insecure-preoccupied, of romantic partners; Furnian, Simon, Shaffer, & Bouchey, 2002); to have less positive and flexible expectations about the outcomes of hypothetical peer rejection situations (Zimmermann, 1999); and to make less positive attributions of peer integration and friendships (Zimmermann, 2004; see also Mikulincer & Selinger, 2001, for similar findings with respect to adolescents’ self-reported attachment styles).

Attachment and adolescents’ secure base scripts. One study has examined links between attachment and adolescents’ use of a secure base script when processing social information. Using the Adolescent Script Assessment (Steiner, Arjomand, & Waters, 2003; based on the standard assessment used to examine secure base scripts in adults by H. S. Waters & Rodrigues-Doolabh, 2001), Dykas, Woodhouse, Cassidy, and Waters (2006) asked adolescents to use six word sets (two mother-related sets, two father-related sets, and two sets about unfamiliar adults) to generate six stories (i.e., one story with each word set). Evidence of schematic information processing emerged such that as adoles-
adults were more open to processing emotionally difficult information to complete the Stroop task more quickly) and that secure adults. This finding suggests that these insecure adults suppressed threatening (but not positive or neutral) words than did secure disorders demonstrated shorter latencies in naming the colors of Brosschot, 2003). More precisely, insecure adults with anxiety that some adults may suppress their attention to emotional stimuli, can be viewed as their attention from negative social stimuli, can be viewed as reflecting not suppression but rather schematic processing. (The notion that adults with insecure attachment styles (particularly avoidant attachment styles) often suppress their attention to emotional stimuli may indicate that being in such a relationship predisposes an avoidant attachment style to adults’ selective attention away from information related to attachment figures when threatened). Interestingly, this link only emerged in adults who were currently in romantic relationships, which indicated that avoidant individuals’ propensity to divert their attention away from information related to attachment figures when threatened). Interestingly, this link only emerged in nonclinical participants. Interestingly, experimental data collected by Maier et al. (2004) also indicated that when adults were primed with negative attachment-related stimuli, they showed greater difficulties than did nonprimed adults providing positive evaluations of the self and others as their degree of AAI attachment security (coded with the AAI Q-Sort) decreased and their degree of dismissiveness (but not preoccupation) increased.

In addition to using the AAI, researchers have examined whether attachment style measures are linked to adults’ attention to social information. In a series of experimental studies, Dewitte and colleagues (Dewitte & De Houwer, 2008; Dewitte, Koster, De Houwer, & Buysse, 2007) examined how adults’ ECR scores were linked to selective attention to different types of social information. In one study, evidence of cognitive suppression emerged such that increases in both attachment anxiety and avoidance were linked to participants diverting attention away from negative attachment-related words (Dewitte, Koster, et al., 2007). In another study examining adults’ selective attention to positive and negative facial expression (as assessed with an exogenous cueing task; Posner, 1980), a combination of high scores on both ECR avoidance and anxiety was associated with greater diverting of attention away from negative and threatening facial displays (Dewitte & De Houwer, 2008).

Other data indicate that more insecure attachment styles are linked to poorer attention to emotionally significant information (Fraley, Garner, & Shaver, 2000) and to greater difficulties with integrating new information into existing cognitive structures (Mikulincer, 1997; see also Green-Hennessy & Reis, 1998). Moreover, in a line of work similar to that of Dewitte and colleagues (Dewitte & De Houwer, 2008; Dewitte, Koster, et al., 2007), Edelstein and Gillath (2008) reported data consistent with the notion that attachment avoidance is linked to the cognitive suppression of attachment and non–attachment-related social information. Using an emotional Stroop task (Williams, Mathews, & MacLeod, 1996), these researchers reported that avoidant individuals tended to inhibit their attention to negative and positive attachment-related information but not to non–attachment-related information (see also Mikulincer, Gillath, & Shaver, 2002, for experimental data indicating that avoidant adults were likely to divert their attention away from information related to attachment figures when threatened). Interestingly, this link only emerged in individuals who were currently in romantic relationships, which may indicate that being in such a relationship predisposes an avoidant person to engage in defensive information processing strategies (see also Mikulincer, 1998a, for evidence linking insecure attachment styles to adults’ selective attention away from words describing romantic partner behavior). Furthermore, data indicated that avoidant individuals’ propensity to divert their attention away from attachment-relevant social information is a relatively effortful process and that increasing an individual’s cognitive load may impede the capacity of the internal working model to protect an avoidant individual from processing such information.

Although the data described above are generally consistent with the notion that adults with insecure attachment styles (particularly avoidant attachment styles) often suppress their attention to emotional information, other data indicate that such suppression may
not always emerge. Anxious adults, for example, have shown heightened attention to basic types of attachment-related information. More precisely, adults reporting higher ECR anxiety scores have been shown to selectively attend to the names of attachment figures (Dewitte, De Houwer, Koster, & Buysse, 2007; Mikulincer, Gillath, & Shaver, 2002). Moreover, insecure-ambivalent adults (classified using a modified version of Hazan and Shaver’s attachment style measure) have been shown to attend relatively quickly to attachment-related words under stressful and nonstressful conditions (whereas secure adults only showed heightened attention to these words under stressful conditions; Mikulincer, Birnbaum, Woddis, & Nachmias, 2000). These data indicate that insecure- anxious individuals were biased in attending to basic forms of attachment-related information, but their attention to this sort of information does not provide a window into whether it was negatively or positively biased.

However, in some cases where avoidant adults have been shown to suppress attachment-relevant information (in regard to feedback seeking in romantic relationships), insecure-anxious adults have been shown to process such information in a negatively biased schematic manner. In two experimental studies, Rhodes and colleagues (Rhodes, Simpson, Tran, Martin, & Friedman, 2007) examined the extent to which the ECR predicted adults’ desires to explicitly seek information about the self and romantic partners. Adults reporting greater attachment-related avoidance were more likely to use information-seeking strategies that suppressed receiving attachment-relevant social information about partners (e.g., highly avoidant adults sought to limit the amount of information they could gather about their romantic partners). Moreover, when the researchers manipulated the participants’ psychological distress (i.e., by having participants read an unsupportive note, ostensibly from their romantic partner), highly avoidant individuals preferred seeking more nonintimate relationship information (e.g., information about the partner’s career choices) than intimate relationship information. Conversely, adults reporting greater attachment-related anxiety were more likely to seek out negative information about their own relationship behaviors and characteristics in both high- and low-stress conditions.

Similarly, Brennan and colleagues (Brennan & Bosson, 1998; Carnelley, Israel, & Brennan, 2007) reported findings demonstrating evidence of suppression in avoidant adults and schematically biased processing in anxious adults with regard to feedback seeking in romantic relationships. More precisely, adults with higher ECR avoidance reported less openness and greater indifference to romantic partner feedback, whereas adults with higher ECR anxiety sought greater positive feedback about their romantic relationships yet responded more negatively to such feedback (leading to feelings of estrangement from romantic partners). Carnelley et al. also provided experimental evidence indicating that attachment anxiety plays an especially prominent role in feedback seeking such that more anxious adults are more affected by partner feedback (and are more willing to incorporate negative feedback into their self-views) and more likely to be negatively emotionally affected by such feedback.

Attachment and adults’ memory for social information.

Several studies have examined links between attachment and adults’ memory for social information. In studies conducted with the AAI, experimental data (consistent with the notion of suppression) have emerged, indicating that insecure adults recalled fewer emotionally laden words than did secure adults in a free-recall task (Zeijlmans van Emmichoven et al., 2003). Other studies, however, have shown that the AAI is not linked to non-attachment-related autobiographical memories (Bakermans-Kranenburg & van Ijzendoorn, 1993; Sagi et al., 1994). Studies examining adults’ attachment styles and memory have been plentiful and have indicated that attachment insecurity is linked to defensive suppression. In a series of four studies, for example, Fraley and colleagues (Fraley & Brumbaugh, 2007; Fraley et al., 2000) asked adults to listen to a tape-recorded clinical interview of a woman describing her family relationships that contained many attachment-related themes. After hearing this story, participants completed a cued-recall test or an implicit memory test. In all four studies, avoidant individuals showed the greatest difficulties remembering information from the interview, even when there was a monetary incentive to remember such information (Fraley & Brumbaugh, 2007). Relatedly, Edelstein (2006) reported an association between attachment avoidance and working memory deficits for both positive and negative attachment-related information.

Links between adults’ attachment styles and their memory for personal events have also been examined in a variety of studies. Using the Hazan and Shaver (1987) method to assess attachment and an experimental memory paradigm, Mikulincer and Orbach (1995) asked adults to recall four emotional memories from childhood (in which they were happy, sad, angry, and anxious) and to rate how they had remembered feeling during these experiences. Evidence of cognitive suppression emerged such that with respect to general recall, insecure-avoidant adults required the greatest amount of time to recall sad and anxious memories and provided the least intense emotional ratings of these memories. They were also the least likely to recall memories from early in their childhood (e.g., their memories typically were more recent in time.) Of interest, within-group analyses further indicated that the emotional content of memories influenced adults’ abilities to recall such memories as a function of attachment. More precisely, whereas insecure-avoidant adults recalled each of the four memories in roughly the same amount of time, insecure-ambivalent adults recalled sad, angry, and anxious memories more quickly than happy memories, and secure adults recalled happy and anxious memories more quickly than sad or angry memories. In a related study, Sutin and Gillath (2009) reported that increases in ECR avoidance were linked to less coherent memories for experiences with romantic partners (as assessed by the ease with which these memories could be recalled and/or envisioned). Edelstein et al. (2005) also found that childhood sexual abuse survivors had more profound deficits in memory for their abusive experiences as their degree of attachment avoidance increased. However, Qin, Ogle, and Goodman (2008) reported that adults’ attachment styles were not linked to their memory for childhood experiences (not necessarily attachment-related experiences), as assessed with parents’ reports of childhood events that these adults had (or had not) experienced.

Data on links between attachment styles and schematic memory biases have also emerged. Attachment insecurity, for example, has been linked to less positive and/or less accurate memories for other adults (Mikulincer, 1998b; Mikulincer & Horesh, 1999; Rom & Mikulincer, 2003), including those involving romantic partners (e.g., Pietromonaco & Barrett, 1997; see also Mikulincer & Arad, 1999). Similarly, in a recent study using daily diaries, Gentzler and
Kerns (2006) reported links between attachment and memory for negative and positive social daily events such that increases in ECR anxiety and avoidance were linked to participants’ remembering daily social events less positively than they had originally perceived them 1 week earlier. Adults’ attachment-related memory biases also appear to have important functional ramifications when adults are experiencing a negative emotional state. Peregr and Mikulincer (2004), for example, reported that secure adults were likely to recall positive information when they were experiencing a negative affective state, whereas insecure-anxious adults were likely to recall less positive information. These schematically biased information processing patterns might help secure adults more readily repair their mood (by encoding and recalling information of a positive nature) and contribute to insecure-anxious adults maintaining their negative mood (by encoding and recalling negative information.)

In a recent study, Simpson, Rholes, and Winterheld (2010) used the procedure devised by Feeney and Cassidy (2003) and Dykas et al. (2010) to examine links between attachment and reconstructive memory (described above) and reported similar findings with romantic couples. This study is notable because the data suggest that attachment alters adults’ view of the self in a schematically biased way over time such that insecure-avoidant adults draw on the unsupportive character of their internal working models of self when attempting to recall memories of interpersonal stress, whereas insecure-anxious adults draw on an internal working model of self as socially dependent (i.e., nonautonomous) during interpersonal stress.

Of note, data from one recent investigation suggests that adults may at first process attachment-relevant social information schematically but then suppress it as a function of their attachment styles (Haggerty, Siefert, & Weinberger, 2010). In this study, adults were instructed to freely recall childhood experiences before the age of 14 years. (Although this task was similar to the one used by Mikulincer & Orbach, 1995, participants in this study were not instructed to remember a particular emotionally laden childhood memory). Results indicated that although increases in attachment-related anxiety and avoidance were linked to remembering a greater number of negative childhood memories, only increases in avoidance were linked to remembering a greater number of negative memories involving caregivers. However, once these memories were recalled, adults reported these memories as less intense as their ECR avoidance increased, a finding similar to that reported by Mikulincer and Orbach (1995). These data suggest that the nature of the task used to elicit the processing of attachment-relevant social information may be a key factor in whether individuals suppress information or process it schematically.

Finally, researchers who have experimentally primed adults’ attachment security have reported data in support of attachment-related expectations and then asked them (a) to read an attachment-related story about close friendships and (b) to complete a cued-recall task. Compared with all other participants, insecure-fearful adults (as assessed with the Relationship Questionnaire) were the most likely to recall negative events in the friendship story regardless of whether they were primed to have negative or positive attachment-related expectations. Miller (1999) also reported data indicating that whereas insecure-fearful adults showed better memory for separation between friends in these stories, secure adults showed better memory for friends engaging in joint activities. Intriguing evidence also indicates that experimentally primed security enhances memory for emotionally salient stimuli and personal experiences (Mikulincer, Gillath, et al., 2001; Rowe & Carnelley, 2003). Mikulincer, Gillath, et al. (2001), for example, found that promoting greater security (i.e., through the presentation of attachment-related pictures showing a distressed person being helped and physically comforted by an opposite-sex partner)—as opposed to priming with affectively positive or neutral materials—enabled adults to have better memory for experiences in which they responded empathetically to another person’s distress.

**Attachment and adults’ perceptions, expectations, and attributions.** A wealth of data lends considerable support to the notion that adults perceive other persons in a schematically biased way as a function of attachment. AAI attachment insecurity, for example, has been linked to perceptions of others as less trustworthy (Larose & Bernier, 2001), to more negative perceptions of romantic partners (Crowell, Treboux, Gao, et al., 2002; Crowell, Treboux, & Waters, 2002; Eiden, Teti, Corns, 1995), and to more negative perceptions of one’s own children (e.g., Benoit, Zeanah, Parker, Nicholson, & Coolbear, 1997; Slade, Belsky, Aber, & Phelps, 1999). Data also indicate that adults’ attachment styles are linked to schematic perceptual biases, expectations, and attributions. For example, research has shown that adults with insecure attachment styles (as assessed with the ECR, the Relationship Questionnaire, and similar measures) are less likely than their counterparts to view attachment figures as emotionally and instrumentally supportive (Florian, Mikulincer, & Bucholtz, 1995), to perceive romantic relationships and the behavior of romantic partners in a positive light (Collins & Feeney, 2004; Collins & Read, 1990), to see others persons as worthy of help, to perceive other persons’ needs, and to believe they are able to help others effectively (Reizer & Mikulincer, 2007). Collins and Feeney (2004), for example, reported that increases in attachment anxiety and avoidance were associated with a greater likelihood that adults would perceive ambiguous forms of social support from real-life romantic partners as less helpful and less well intended. Insecure adults have also shown less positive expectations of interpersonal closeness, dependency, and trust (e.g., Baldwin, Fehr, Keedian, Seidel, & Thomson, 1993; Rowe & Carnelley, 2003), more negative attributions of the causes of infants’ emotional states (Leerkes & Siepak, 2006), and more hostile attributions of others’ behaviors (Mikulincer, 1998a; Peregr & Mikulincer, 2004). Interestingly, recent experimental data indicate that the explicit and implicit negative views of romantic partners that insecure-ambivalent individuals experience may dampen any positive views these individuals also have of their partners (Mikulincer, Shaver, Bar-On, & Ein-Dor, 2010).
Similarly, romantic attachment style differences have emerged in the way in which adults modify their perceptions of others (Mikulincer & Arad, 1999; Mikulincer, Orbach, & Iavnieli, 1998; Zhang & Hazan, 2002). Mikulincer et al. (1998), for example, provided experimental evidence, consistent with the notion of schematic information processing, that when emotionally distressed, insecure-avoidant adults (as assessed with the Hazan and Shaver attachment style measure) were more likely than secure adults to view other persons as less similar to the self in order to distance themselves cognitively and/or emotionally from other persons. Interestingly, however, when under emotional distress, insecure-ambivalent adults viewed others as more similar to the self (in order, perhaps, to foster greater closeness to others).

In an intriguing study, Mikulincer (1998a) reported that adults’ expectations of their romantic partners in anger-related contexts (assessed experimentally with a lexical decision task) were schematically biased as a function of their attachment styles (assessed with the Hazan and Shaver measure). In this task, participants were repeatedly presented with four incomplete sentences (i.e., two anger-relevant sentences and two anger-irrelevant sentences) over the course of 96 trials and were instructed to indicate whether the word completing each sentence was a word or a nonword (the words described the partner responding either positively or negatively to the participant in the anger and nonanger episodes or were neutral in nature). Significant results emerged for the anger-relevant sentences only: compared with insecure-avoidant and insecure-ambivalent adults, secure adults completed this task more quickly when positive words completed the anger-relevant sentences; in contrast, compared with secure adults, insecure adults completed the task more quickly when negative words completed the sentences. Within-group analyses further indicated that secure adults responded more quickly to positive than to negative response words, whereas avoidant and anxious-ambivalent adults responded more quickly to negative than to positive response words in anger-relevant contexts.

Finally, experimental studies have shown that priming attachment security causes adults to have more positive perceptions of others (for a recent comprehensive review of these studies, see Gillath, Selcuk, & Shaver, 2008; Mikulincer & Shaver, 2007b, 2007c). Such priming has been linked to more positive expectations of others (including romantic partners; Carnelley & Rowe, 2007; Pierce & Lydon, 1998; Rowe & Carnelley, 2003) and to more positive group-related perceptions (Rom & Mikulincer, 2003). In a notable set of five studies, Mikulincer and Shaver (2001) reported that adults who were primed to feel a sense of security (to feel loved and surrounded by supporting others) were generally more likely than adults in positive affect or neutral priming conditions to attenuate their negative perceptions of out-group targets.

**Attachment and adults’ secure base scripts.** When writing about internal working models and information processing, Bowlby (1980) quoted Goethe’s well known claim that “we see only what we know” (p. 44). Nowhere is this idea more evident than in the research related to attachment scripts of adults (as it was in research with children and adolescents, presented earlier). As described earlier, the most commonly used paradigm for examining attachment scripts consists of asking participants to use word sets (containing 12 word prompts each) to create a brief narrative (H. S. Waters & Rodrigues-Doolabh, 2001). In this section, we review findings with adults indicating that when participants look at these word sets, order and organize them, and embed them within other words to create a narrative, the narrative that they “see” is indeed the one that they know (i.e., their knowledge of attachment as assessed with the AAI and the ECR).

Four studies, for example, have examined links between the AAI and the quality of mothers’ secure base scripts (Coppola, Vaughn, Cassibba, & Costantini, 2006; Dykas et al., 2007; Guttmann-Steinmetz, Elliot, Steiner, & Waters, 2003; H. S. Waters & Rodrigues-Doolabh, 2001). H. S. Waters and Rodrigues-Doolabh reported that greater AAI coherence of mind was linked to a greater propensity to create stories from word prompts (involving children and their parents, as well as adults) that followed a secure base script. Guttmann-Steinmetz et al. also reported that mothers who demonstrated the greatest AAI coherence were the most capable of helping their 4- to 5-year-old children coconstruct stories that followed a secure base script. In addition, evidence indicated that AAI coherence of mind (assessed 3 months prior to marriage) was linked longitudinally to women’s capacities to generate stories about romantic partners that followed a secure base script 8–10 years later (Wais & Treboux, 2003).

Finally, data from eight studies indicate that adults’ attachment styles were linked to abilities to create and complete stories (and interpret intrapersonal events, that is, dreams) that follow a secure base script (Mikulincer, Shaver, Sapir-Lavid, & Avihou-Kanza, 2009). Results generally indicated that adults lower in ECR anxiety or avoidance created and completed stories that followed a secure base script in a more automatic and open manner. Moreover, increases in attachment avoidance were linked to the creation of stories characterized by not seeking care from another person, whereas increases in attachment anxiety were linked to the creation of stories characterized by not being comforted by caregiving received from another person.

**Attachment and the Processing of Social Information Across Generations**

Several studies have examined pieces of a larger theoretical component of attachment theory (e.g., Bowlby, 1973) stating that parents’ attachment security and their corresponding ways of processing social information contribute to their children’s quality of attachment to them and ultimately to the manner in which children learn how to process social information. According to this model, insecure (but not secure) parents will process attachment-relevant social information about their children in a defensive and negatively biased manner, and this type of information processing will likely contribute (through insensitive parenting behaviors) to their children becoming insecurely attached to them and to the development of these children’s defensive and negatively biased schematic information processing strategies. Main et al. (1985) were the first to find empirical evidence for distortions or suppression in information processing and their endurance across generations (see also Bowlby, 1973, 1988; Bretherton & Munholland, 2008; Fraiberg, Adelson, & Shapiro, 1975; George & Solomon, 2008; Hesse & Main, 1999; A. Lieberman, Silverman, & Pawl, 1999; van IJzendoorn, 1995). In this section, we examine data on these intergenerational links by reviewing studies that have examined (a) whether parents’ attachment security is linked to their children’s social information processing and, conversely, (b) whether chil-
Children's attachment security is linked to their parents' social information processing.

**Parents' attachment and children's social information processing.**

Several studies have reported links between parents' attachment styles and children's memory for social information (Alexander et al., 2002; Goodman, Quas, Batterman-Faunce, Riddlesberger, & Kuhn, 1997; Qin et al., 2008; Reese, 2008). Considered as a whole, these studies indicate that children engage in defensive suppression of emotional autobiographical memories as a function of their parents' attachment insecurity. In one study, for example, Goodman et al. (1997) found that compared with children of secure parents (as assessed with Hazan and Shaver's attachment style measure), children of insecure parents often had inaccurate memories for stressful medical treatments (e.g., these children would agree with false statements regarding the treatments and disagree with true statements). In a similar study, Alexander et al. (2002) reported additional evidence that insecure attachment styles in parents (as assessed with the ECR) were linked to their children's poorer memory for stressful events. For example, greater parental attachment anxiety was linked to less accurate and more inaccurate child memory for these events. Of interest, children of highly avoidant parents also showed poorer memory as the degree of stress they had experienced during these procedures increased, but children of low-avoidant parents showed greater memory as the degree of stress they experienced increased. These latter findings are intriguing because they suggest that children of avoidant parents may have difficulties in encoding and/or recalling emotionally and physically painful memories, whereas children of more secure parents remain open to painful experiences and can accurately recall these experiences. In a related study, Qin et al. (2008) reported that parents' attachment styles (assessed with the Relationship Questionnaire) were linked to their adult children's false memory (but not true memory) for specific positive and negative childhood events (e.g., greater fearful avoidance and preoccupation in parents was linked to a greater propensity in their adult children to show false memories for specific childhood events).

**Mothers' attachment and children's emotional understanding.**

One longitudinal study reported that mothers' AAIs in children's attachment classifications during pregnancy predicted their children's understanding of hypothetical negative social events at age 11 years (M. Steele et al., 2002). Children whose mothers' AAIs had been insecure were more likely than other children to show suppression of negative emotions. For example, these children were less likely than other children to understand that certain negative life events, such as child–parent separation, were typically distressing for children. These children were also less likely to elaborate on why such negative events were distressing and how a child's distress might be resolved.

**Children's attachment and parents' social information processing.**

**Children's attachment and parents' attention.** At the most fundamental level, children's attachment can be viewed as linked to parental attention to children's own behavior. For instance, Bowlby (1988) noted that when a parent selectively attends to some aspects of the child's emotional signals and "turns a blind eye" (p. 132) to others (a practice that may constitute either schematic processing or maternal suppression), infant–parent interaction patterns develop that contribute to insecure attachment. Empirical support for a link between infant attachment and maternal selective attention to infant emotions comes from a study of mother–infant free play (K. E. Grossmann, Scheuerer-Englisch, & Loher, 1991; see also K. Grossmann, Grossmann, Kindler, & Zimmermann, 2008). Mothers of avoidant infants were found to be more likely to attend to and join in play with their infant when the infant was content but withdrew attention and interaction when the infant expressed negative affect; the pattern was reversed among mothers of securely attached infants, who were likely to attend when the infant expressed negative emotions and needed soothing. Main (1999) too has described maternal insensitivity as a reflection of maternal selective attention—guided, in turn, by her wish to maintain her own state of mind with respect to attachment. Moreover, to the extent that AAIs can be viewed as reflecting selective parental attention during the construction of an attachment-related narrative, the considerable body of research revealing links between parental AAIs and infant and child attachment are relevant here (see van IJzendoorn, 1995, for a meta-analysis).

In addition to these observational studies, one experimental study (Atkinson et al., 2009; described earlier) examined schematic links between children's attachment (assessed with the Strange Situation and parents' attention to social information (i.e., negative and neutral words presented during a Stroop task). Compared with mothers of organized infants, mothers of disorganized infants completed the Stroop task more slowly when processing negative words, suggesting that mothers of disorganized infants were having difficulties disengaging their attention from these words.

**Adolescents' attachment and parents' memory.** To our knowledge, no published study has examined whether children's attachment is associated with parents' memory for attachment-relevant social information, but one study has examined this association in adolescents and their parents (Dykas et al., 2010). In this study (described earlier), adolescents engaged in a 10-min conflict discussion with each parent. Parents rated their perceptions of this conflict both immediately following the discussion and again 6 weeks later. Evidence of schematically biased processing emerged such that mothers of secure adolescents (as assessed with the AAI) viewed the interactions more favorably over time, whereas mothers of insecure adolescents viewed them less favorably. No significant results emerged with respect to fathers.

**Children's attachment and mothers' secure base scripts.** Several studies (conducted across a variety of cultures) have reported links between child attachment and mothers' ability to create stories schematically following a secure base script. Mothers of securely attached infants (assessed with the Strange Situation) and children (assessed using the observer-rated Attachment Q-Sort) were more likely than other mothers to create stories about child–mother and adult–adult interactions that followed a secure base script (Bost et al., 2006; Tini, Corcoran, Rodrigues-Doolabh, & Waters, 2003; Vaughn et al., 2007; Veríssimo & Salvaterra, 2006).

**Infants' attachment and parental mind-mindedness, insightfulness, and reflective functioning.** Several studies have investigated whether infant attachment is associated with a mother's capacity to understand her infant's mental states. Ainsworth (1969) initially referred to this capacity in terms of a mother being able to
see things from the baby’s point of view and created a sensitivity scale to tap this maternal behavior. In addition to being used repeatedly in attachment research, this scale has contributed to more recent theory about the importance of considering maternal attention to infant mental states. In particular, Meins (1997, 1999) termed this capacity maternal mind-mindedness, which she conceptualized as mothers’ ability to use “information from their children’s outward behavior in making accurate inferences about the mental states governing that behavior” (Meins, Fernyhough, Fradley, & Tuckey, 2001, p. 638). Mind-minded mothers possess a capacity to attend to their infants’ dynamic and complex mental states and can easily shift and refocus their attention from one state to another as states emerge. Moreover, these mothers demonstrate a capacity to “read” their infants’ minds and to understand how their infants’ mental states reflect their infants’ day-to-day experiences, possibly reflecting an ability to store the infants’ experiences in memory and/or to recall these memories when necessary.

Several studies have reported an association between insecure child attachment (as assessed with the Strange Situation) and less competent parental mind-mindedness, which may indicate that parents of insecure children suppress the processing of information related to their children to some degree or at least fail to make connections between their children’s behavior and internal states. In a 2-year longitudinal study, for example, infant attachment at 12 months predicted mothers’ mind-mindedness when infants were 3 years of age; compared with mothers of children who had been secure, mothers of children who had been insecure were less likely to describe their children in terms of their mental characteristics, less likely to incorporate child-related information into behavioral caregiving responses, and more likely to describe them in terms of their physical appearance and/or behavioral tendencies (Meins et al., 1998; see also Arnott & Meins, 2007, for longitudinal links between both maternal and paternal mind-mindedness and earlier infant attachment; see Meins et al., 2001, 2002, for similar data linking maternal mind-mindedness longitudinally to subsequent child attachment quality at 12 months of age).

In addition to the construct of maternal mind-mindedness, related aspects of mothers’ abilities to understand their children’s mental states have been examined as potential links to children’s attachment security assessed in the Strange Situation. Oppenheim and Koren-Karie (2002), for example, have used the term maternal insightfulness to refer to a mother’s ability to see things from her infant’s point of view (i.e., the ability to understand the motives of her child’s behavior, to possess an emotionally complex view of the child, and to demonstrate openness to new information regarding the child). As expected, mothers who have shown more insightfulness regarding their children were more likely than other mothers to have securely attached children (Koren-Karie, Oppenheim, Doyle, Sher, & Etzion-Carasso, 2002; Oppenheim, Koren-Karie, & Sagi, 2001). Other researchers (Slade, Grienengerber, Bernbach, Levy, & Locker, 2005) have reported that mothers who have secure infants are more likely than other mothers to score higher on measures of reflective functioning, which is a mother’s ability to hold her baby and his or her mental state in mind (Fonagy et al., 2002; see also Slade, 2005).

Conclusions and Future Research Directions

Researchers have used Bowlby’s attachment theory—and principally the notion of internal working models of attachment—to understand the nature of human social information processing. However, as Bretherton and Munholland (2008) noted, Bowlby’s internal working model construct can be viewed “not [as] a fully worked-out theory, but [as] a promising conceptual framework to be filled in by others” (p. 103). This review is intended to contribute to Bowlby’s framework by examining the empirical literature on how internal working models of attachment are linked to human social information processing phenomena, a literature unavailable to Bowlby. We now draw some general conclusions and add greater specificity to Bowlby’s original theorizing. We also provide some directions for future research.

Social Information Processing as a Function of Information Type and Attachment Quality

Existing data reveal a pattern, evident across development and across generations, wherein secure individuals process attachment-relevant social information relatively fully and flexibly. They do not routinely exclude or suppress attachment-relevant social information to avoid experiencing psychological pain but instead process a variety of positively and negatively laden information openly. These individuals also process information in a positively biased schematic fashion by drawing on the positive knowledge that is thought to be incorporated into their internal working models of attachment.

Insecure individuals, in contrast, exclude or suppress attachment-relevant social information that is linked (a) to attachment figures, either directly or tangentially, and (b) to specific mental knowledge of attachment-related childhood events that, if brought to conscious awareness, could cause psychological pain. We propose that these defensive cognitive strategies are revealed empirically when experimental and nonexperimental methodologies make individuals either relatively passive or, alternatively, highly active processors of potentially psychologically painful social information concerning attachment figures. We discuss these contexts below.

When individuals are required to passively process (i.e., automatically, with no effortful conscious mental control) attachment-relevant social information in inconspicuous attention and memory tasks (e.g., when individuals simply view information and are not required, through any direct instruction, to consciously respond to the information), insecure internal working models typically appear to function to instigate implicit/nonconscious mental strategies that limit an individual’s attention to, or memory for, such information. These deficiencies in insecure individuals’ attention and memory are not easily observable and are only detected when methodologies allow researchers to examine precisely subtle indicators of attention and memory that do not appear to be entirely under the conscious control of the individual. For example, as described earlier, data have emerged indicating that insecure children suppress their attention to and memory for attachment-relevant social information when asked to simply view attachment-related drawings (where eye movements are recorded to assess attention and incidental recall tasks are used to assess memory; e.g., Kirsh & Cassidy, 1997; Main et al., 1985). Studies have also
indicated that insecure adults suppress their attention and/or memory when simply instructed to view attachment-related words, and similar measures are used to assess attention and memory, such as the Stroop task (e.g., Dewitte, Koster, et al., 2007; Edelstein, 2006; Edelstein & Gillath, 2008; Fraley & Brumbaugh, 2007; Zeijlmans van Emmichoven et al., 2003). The one study reviewed here that could be perceived as not supporting this phenomenon (i.e., Atkinson et al., 2009), in fact, examined a rarely studied AAI attachment group, finding that mothers classified as insecure-unresolved demonstrated greater attention to negative words than to neutral words in the Stroop task. Although the Stroop task is typically regarded as measuring implicit information processing, insecure-unresolved mothers may be so vigilant to negative information that they may actively process and be aware of the negative information presented in this task.

A variety of methodological paradigms have also revealed striking evidence that insecure individuals engage in exclusion when processing social information pertaining to attachment figures in a highly active, conscious, and mentally effortful way (i.e., when asked specifically to think about such information, and when such thinking required a considerable amount of conscious effortful control involving a variety of mental resources). In the introduction to this article, we described how insecure individuals show varying degrees of suppression or exclusion during the AAI when they are asked repeatedly to attend to, recall from memory, and/or construct mental responses to positive and negative attachment-related events that happened long ago in childhood, which are stored in long-term memory and are not readily accessible (see also Hesse, 1999, 2008). In our literature review, we have provided additional evidence that insecure adolescents and adults (at least insecure-avoidant individuals) exclude or suppress attachment-relevant social information related to parents in memory tasks dealing with remembering childhood experiences (Dykas & Cassidy, 2010; Mikulincer & Orbach, 1995). Indeed, in these situations, the implementation of highly effortful mental processes may serve as a trigger for insecure individuals’ internal working models of attachment to function in a way that prevents such information from being processed, in the service of protecting these individuals from becoming aware of attachment knowledge that would be psychologically painful to process.

Notably, insecure individuals appear to process information about attachment figures, attachment-related events, and other persons in a negatively biased schematic manner in cases in which they are consciously aware of the information yet do not have to expend much conscious effortful control processing such information. In these cases, insecure individuals likely draw on the negative attachment-related knowledge that is thought to be incorporated into their internal working models of attachment and process information in a conscious, yet relatively non-effortful and cursory manner. Moreover, because this schematic cognitive processing pathway does not involve a high degree of mental effort, it is relatively unlikely that individuals will associate this information with potentially painful attachment-related knowledge; therefore, there is no trigger for insecure individuals’ internal working models to function to exclude or suppress the information from being processed. The large research literatures on children’s, adolescents’, and adults’ perceptions, expectations, and attributions about other persons lends support to this notion (e.g., when asked to simply describe, but not provide considerable detail about, experiences with other persons, insecure individuals across the life span typically generate negative descriptions; Larose & Bernier, 2001; Seuss et al., 1992; Zimmermann, 2004).

Future Directions

Although a wealth of data exists about links between attachment and the processing of attachment-relevant social information, in future work, researchers could contribute to current knowledge of these links in several important ways. First, additional research is needed to understand the conditions under which insecure individuals sometimes exclude attachment-relevant social information and sometimes process it with a negative schematic bias. Although the majority of the existing studies have not examined such conditions, the intriguing data reported by Haggerty et al. (2010) on adults’ attachment-related memory processes demonstrate that insecure individuals may switch from processing information schematically to suppressing it if it involves thinking effortfully about the information’s emotional components (recall that avoidant adults’ memory for childhood attachment-related experiences seemed to be suppressed only when these individuals were confronted with the need to process the emotional nature of the memories.) Thus, although we follow Bowlby (1980) in proposing that insecure individuals at times exclude social information in order to avoid experiencing psychological pain, we note that little is known about whether, how, and for whom avoidance of pain occurs (or how much pain is tolerable). It might also be interesting to examine other types of pain, perhaps physical pain (see MacDonald & Leary, 2005). Although we have speculated about the ways in which the nature of the information processing tasks may play a role, empirical examination of these propositions is needed (especially in regard to children’s theory of mind and emotional understanding, where the issue of whether insecure children exclude and/or process information schematically is particularly complex).

Second, more insights are needed into how different aspects of internal working models of attachment (e.g., attachment patterns, state of mind with respect to attachment, attachment styles, attachment-related representations of parents) link to specific aspects of information processing. We are hesitant to draw conclusions regarding whether some aspects of internal working models are linked more or less strongly (or not linked at all) to different types of information processing because almost all studies we reviewed used a single observational, interview, or self-report methodology to assess the quality of participants’ internal working models of attachment. In future work, investigators should aim to examine how different measures of attachment link to different types of information processing. For example, when examining attention to attachment figures, is the “attachment effect” greater for AAI-derived attachment variables (e.g., AAI coherence of mind) or for ECR-derived variables (e.g., attachment-related anxiety and avoidance)? Moreover, experimental studies in which attachment quality is manipulated allow researchers to conclude whether individual differences in attachment cause corresponding differences in social information processing, whereas nonexperimental studies cannot. Although we are aware of the conceptual and empirical difficulties (and potential ethical dilemmas) associated with manipulating attachment security, researchers should consider ways in which attachment could be manipulated to test
experimentally the conceptual causal model presented in this article (e.g., the relatively new adult security priming methodologies are promising in this regard; see Over & Carpenter, 2009, for experimental priming of prosocial behavior in 18-month-old infants).

In a similar vein, when conducting longitudinal studies that examine whether early attachment predicts later information processing, a second attachment assessment could be included contemporaneously with the information processing measures. Such a design allows examination of whether links between earlier attachment and later information processing are attributable simply to (stable) concurrent attachment or whether these links persist in the face of a change in attachment. Moreover, although being secure in infancy places a person on a trajectory toward a variety of positive outcomes later in life (e.g., E. Waters et al., 2000), this trajectory is not deterministic and may be redirected toward problematic outcomes through a wide range of negative life experiences (e.g., subsequent maternal depression; see Weinfield, Stroufe, & Egeland, 2000). Relatedly, little is known about the information processing patterns of individuals whose AAI profiles are characterized by lack of resolution when discussing trauma or death (i.e., insecure-unresolved individuals); future studies could provide important insights. It would also be interesting to examine whether expected positively biased schematic information processing patterns in secure individuals do not emerge when these individuals have experienced some sort of negative life experience that has changed their perceptions of self and others (e.g., outgroup exclusion such as racism). In short, studies considering concurrent attachment and attachment-altering life events could provide a window into lawful discontinuity between attachment and social information processing (i.e., by identifying the circumstances under which the expected links between attachment and social information processing do not emerge).

Future research also could examine issues of discriminant validity by incorporating non–attachment-related psychological variables into various methodological designs to determine whether attachment but not other variables (such as those assessing personality structures and psychosocial functioning) predict information processing (e.g., a third variable such as non–attachment-related depression could explain a potentially spurious link between insecure attachment and negative information processing patterns). (In experimental priming studies, researchers have examined whether non–attachment-related primes are as effective as attachment-related primes in promoting positive social and/or emotional functioning; see Mikulincer & Shaver, 2001; see also Mikulincer, Hirschberger, Nachmias, & Gillath, 2001). Further, such examinations could provide additional information about the extent to which the internal working model construct is a distinct psychological concept. For example, some researchers have suggested that insecurity of attachment (especially attachment preoccupation) be considered a proxy for more general types of neuroticism (see Noffle & Shaver, 2006). One straightforward test of this hypothesis would be to determine whether indices of attachment, but not neuroticism, are linked to core social information processing features.

Data on adolescents’ attachment-relevant social information processing are also currently lacking. Although the early work of attachment theorists set the stage for examining adolescent attachment processes (e.g., Allen & Land, 1999; Bretherton, 1990; Kobak & Sceery, 1988), and more recent theoretical and empirical inroads have been made to understanding attachment and information processing in adolescence (Dykas & Cassidy, 2007), substantially less research has been conducted with adolescents than with children and adults. Considering that adolescence is marked by (a) significant qualitative changes in the structure of adolescents’ internal working models of attachment, (b) significant behavioral changes in the adolescent–parent attachment relationship, and (c) the creation of new attachment relationships (e.g., romantic relationships; Allen, 2008; Scharf & Mayselless, 2007), adolescence is a particularly important developmental stage within which to study linkages between attachment and information processing. Longitudinal studies, for example, could shed light on how changes in the nature of adolescent attachment processes affect adolescents’ information processing related to parents and others.

On a different note, future researchers could examine more systematically complex relations among attachment, social information processing, and various social and emotional outcomes. Insecure attachment and deficiencies in social information processing both have been linked separately to a variety of social-behavioral and emotional problems in children and adolescents (for reviews, see Crick & Dodge, 1994; DeKlyen & Greenberg, 2008; Dodge & Pettit, 2003; Dozier, Stovall-McClough, & Albus, 2008). Yet, with a few notable exceptions (e.g., Cassidy et al., 1996, and Sutin & Gillath, 2009), little work has examined the interplay between attachment and social information processing in predicting these outcomes. Using mediation models, researchers could examine whether social information processing mediates the association between attachment and social and emotional adaptation as Bowlby (1973) proposed (see also Dweck & London, 2004). Moreover, considering the great emphasis that psychologists place on understanding how individuals contribute actively and dynamically to their own development (e.g., Scarr & McCartney, 1983), examining real-time and online attachment-related information processing patterns could yield insights into how such patterns affect behavior in actual social–interactional processes with other persons (see, for example, Feeney’s, 2007, study that used instant messenger computer technology to examine participants’ real-time attention to romantic partner support). From an intergenerational perspective, researchers could also examine models whereby, for example, a parent’s insecure attachment leads to his or her negatively biased information processing patterns. These patterns, in turn, potentially result in poor parenting and poor developmental outcomes (including insecure attachment) in the parent’s child (see van IJzendoorn, 1995). Using moderator models, researchers could examine whether links between attachment and socioemotional outcomes are moderated by information processing (cf. data have indicated that maltreated children exhibited externalizing behaviors only when they had maladaptive information processing; Toth, Cicchetti, & Kim, 2002).

From a physiological perspective, researchers could also examine the underlying physiological processes associated with links between attachment and social information processing. Social information processing is—at its core—governed by a variety of different neural mechanisms that relate to both cognition and affect (Insel & Fernald, 2004), and considerable advances have been made in understanding the neuroscience of social cognition (M. D. Lieberman, 2007; Taylor, Eisenberger, Saxbe, Lehman, & Lieberman, 2006). Although neurophysiological explanations for links
between attachment and information processing have yet to be well developed, the literature on maltreated children has demonstrated that children who have experienced strained, abusive, or neglectful attachment relationships are likely to have impaired psychophysiological functioning when processing social information (see Howe, Goodman, & Cicchetti, 2008, for a review; see also Schore, 2010). In adults, the social information processing of individuals who reported having had childhoods that were stressful in attachment-related ways (e.g., not feeling loved and cared for) has been found to be accompanied by unusual patterns of brain activation (Taylor et al., 2006). By identifying neural mechanisms, data could be collected on how the brain processes attachment-relevant social information and what factors contribute to stability or changes in processing over time. How does brain activity vary as a function of an individual’s attachment organization and of the type of social information that is being processed? This question is especially pertinent in light of recent evidence showing that infants’ neural responses to mother-related information are linked to infants’ behavioral responses to separation from mother (Swingler, Sweet, & Carver, 2010; see also Suslow et al., 2009, for related adult data). Moreover, behavioral genetic studies (e.g., twin studies) could prove useful in elucidating whether links between attachment and information processing are genetically mediated or rather result primarily from environmental and contextual factors, as attachment theorists suggest (see Roisman & Fraley, 2008, for an example of how twin studies have been used in attachment research).

Finally, research on links between attachment and social information processing could have promising implications for intervention programs designed to enhance parental sensitivity and reduce the risk of insecure attachment in children. Although there is some debate regarding whether parental mental processes can be—or even need to be—targeted and modified in such programs (as opposed to a sole focus on modifying behavior; see Berlin, Ziv, & Shaver, 2009) indicated that mothers’ attributions about their children’s behaviors could be reframed to promote more positive caregiving behaviors. Several attachment intervention programs include components that address mothers’ cognitions about their children (e.g., Cooper, Hoffman, Powell, & Marvin, 2005; Dozier, Lindhiem, & Ackerman, 2005; Slade, Sandler, & Mayes, 2005). It is reasonable to believe that the efficacy of these intervention programs could be further enhanced through greater understanding of attachment-related differences in social information processing, especially when the intervention goals are hindered by insecure parents’ negative views of their children (and perhaps of others, including the intervention staff) or by a tendency to exclude potentially painful information.

References


ATTACHMENT AND INFORMATION PROCESSING


