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Abstract

Bowlby's (1969/1982) attachment theory has generated an enormous body of research and conceptual elaborations. Although attachment theory and research propose that attachment security provides a person with many adaptive advantages during all phases of the life cycle, numerous studies indicate that almost half of the human species can be classified as insecurely attached or insecure with respect to attachment. It seems odd that evolution left humans in this vulnerable position unless there are some advantages, under at least some conditions, to anxious and avoidant attachment styles. We argue that a social group containing members with different attachment patterns may be more conducive to survival than a homogeneous group of securely attached individuals. In making this argument, we extend the scope of attachment theory and research by considering a broader range of adaptive functions of insecure attachment strategies. We also present preliminary data to support our argument.

Keywords

attachment theory, social defense theory, insecure

Bowlby's (1969/1982, 1973, 1980) attachment theory postulates an inborn behavioral system that emerged as an adaptation over the course of mammalian evolution. Because human infants are born immature and require a long period of care and protection, they are equipped with a repertoire of behaviors that increase the likelihood that they will remain proximal to supportive others. That is, the attachment behavioral system presumably evolved because it increased the likelihood of survival and eventual reproduction on the part of members of a species born with inadequate capacities for defense, locomotion, and feeding.

An enormous amount of research has been conducted since Ainsworth and her students (e.g., Ainsworth, Blehar, Waters, & Wall, 1978) first identified individual differences among infants in the use of various attachment strategies (see Cassidy & Shaver, 1999, 2008, and Mikulincer & Shaver, 2007, for reviews). The major insecure attachment patterns, often labeled *anxious* and *avoidant* (e.g., Mikulincer & Shaver, 2007), are associated with relatively poor adjustment and, in some cases, are associated with psychopathology at various phases of the

life span. For example, insecure adults (whether anxious or avoidant) report higher rates of relationship breakup (e.g., Hazan & Shaver, 1987; Kirkpatrick & Hazan, 1994; Shaver & Brennan, 1992) and more psychological problems (e.g., Mickelson, Kessler, & Shaver, 1997; Mikulincer, Florian, & Weller, 1993) than do secure adults. Nevertheless, research indicates that almost half of living human beings in every age group are insecure with respect to attachment, and the proportion is higher in more disadvantaged (e.g., poorer, less socially stable) populations (Cassidy & Shaver, 1999, 2008; Mikulincer & Shaver, 2007).

This set of facts raises questions concerning how such a high degree of insecurity could have survived evolutionary winnowing over millions of years (Belsky, 1997, 1999; Belsky,

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Steinberg, & Draper, 1991; Chisholm, 1996; Simpson & Belsky, 2008). In this article, we argue that secure and insecure attachment styles may both have unique adaptive advantages (which increase inclusive fitness; see Hamilton, 1964) and disadvantages (which decrease inclusive fitness). As a result, when viewed from either an inclusive-fitness perspective or a group-selection perspective, groups that include individuals with different attachment strategies may have advantages over homogenous groups of relatively secure individuals.

Specifically, we argue that relatively secure individuals tend to remain emotionally stable in the face of threats and can calmly and efficiently coordinate group members' problem-solving efforts. But this behavior may be counterproductive in certain circumstances. For example, when a serious danger arises, the optimism inherent in the secure-base script, as well as the secure person's concern for staying proximal to relationship partners, may reduce a secure individual's ability to recognize the gravity of the threat or respond to it effectively in time to facilitate a safe escape. In such cases, anxious individuals' hypervigilance to threats may benefit members of a group by reacting to early or ambiguous cues of danger and alerting everyone to the threat. Avoidant individuals' concern with self-preservation may facilitate their discovery of an escape route that others can use, even if it was not intended for the others' benefit. In other words, what are usually interpreted as maladaptive attachment strategies may, under some conditions, be beneficial for survival of an individual and members of the individual's group (all of whom, in the environment of evolutionary adaptedness, would often have been genetically related).

In contrast to Belsky and colleagues, who have attempted to link insecure attachment patterns to particular mating strategies, we suggest that the adaptive advantages of insecure attachment patterns may be that they promote the survival of individuals in a group rather than directly promoting reproduction. Of course, there would be no reproduction without survival. Our analysis is not meant to substitute for those of Belsky and his colleagues; it is meant to supplement them. But we do provide reasons for viewing survival benefits of insecure attachment as more important and more likely than direct reproductive benefits.

Attachment-System Functioning

According to Bowlby (1969/1982, 1973, 1980), human beings and many nonhuman primates are born with an innate psychological system (the *attachment behavioral system*) that motivates them to seek proximity to significant others (*attachment figures*) in times of need as a way of protecting themselves from threats and alleviating distress. The goal of the system is objective protection or support and the concomitant subjective sense of safety or security (which Sroufe & Waters, 1977, called "felt security"). This double-sided (objective and subjective) goal is made salient when a person encounters actual or symbolic threats and notices that an attachment figure is not sufficiently near, interested, or responsive (Bowlby,

1969/1982). In such cases, the attachment system is activated and the individual is driven to reestablish actual or symbolic proximity to an external or internalized attachment figure until felt security is attained. Bowlby (1969/1982, 1988) assumed that although age and development result in an increased ability to gain comfort from symbolic representations of attachment figures, no one of any age is completely free from reliance on actual others. The attachment system therefore remains active over the entire life span, as indicated by adults' tendency to seek proximity and support when threatened or distressed (Hazan & Zeifman, 1999).

Many studies have shown that the attachment system is indeed active during adulthood and that it affects many aspects of psychological and social functioning (see relevant chapters in Cassidy & Shaver, 2008; Mikulincer & Shaver, 2007). For instance, Mikulincer and colleagues (e.g., Mikulincer, Birnbaum, Woddis, & Nachmias, 2000; Mikulincer, Gillath, & Shaver, 2002) showed that perceived threats generally cause adults to activate mental representations of attachment figures as a means of coping and regulating emotions. Study participants reacted to threats with heightened mental accessibility of the names of their supportive attachment figures in both lexical decision tasks and Stroop color-naming tasks. As compared with neutral subliminal priming, subliminal priming with threat words (e.g., failure, death, or illness) led to both faster identification of attachment figures' names in a lexical decision task and slower color-naming times for attachment figures' names in a Stroop task. Fast lexical decision times and slow color-naming responses were interpreted as indications of heightened activation of mental representations of attachment figures in threatening contexts.

Bowlby (1969/1982) listed some of the major situations or stimuli that activate the attachment system in early childhood:

Observation of any one child during his second and third years of life, when attachment behavior is most evident, shows that such behavior varies enormously in activation, form, and intensity. At one moment the child is content to explore his surroundings; at the next he is searching for his mother desperately.... Every mother knows that a child who is tired, hungry, cold, in ill health or in pain is likely to be especially "mummy-ish." (p. 311)

Under normal circumstances, this activation is manifested in the actual seeking of proximity to attachment figures. However, there are cases in which these behaviors may be inhibited by the absence of attachment figures or by other personal and contextual factors. In such cases, thoughts about proximity to attachment figures may still be mentally active, and representations of these figures may still influence behavior (Mikulincer & Shaver, 2003).

In addition to describing the normative activation and operation of the attachment system, Bowlby (1973, 1988) and his research collaborator Ainsworth (e.g., Ainsworth et al., 1978) focused on salient individual differences. Although the attachment system is active in every individual, there are individual

differences in the extent to which attachment behaviors are effective in mitigating distress and attaining felt security. When people can attain support and protection when needed, they feel confident about the value of proximity seeking as a coping strategy, are able to trust other people's availability and willingness to provide help and support, and are increasingly able to build resources and skills that allow them to deal autonomously with stress. However, when people fail to attain support and protection from attachment figures, worries and insecurities about proximity seeking and others' goodwill are formed, distress is intensified, and defensive strategies other than confident proximity seeking are developed. Main (1990) labeled these alternatives *secondary attachment strategies*, and later theorists believe they involve either hyperactivation or deactivation of the attachment system (Cassidy & Berlin, 1994; Cassidy & Kobak, 1988; Mikulincer & Shaver, 2003, 2007).

This analysis of individual differences in attachment strategies has influenced personality and social psychologists who study attachment in adolescent and adult samples to focus on individual differences in "attachment style" (see review by Mikulincer & Shaver, 2007). Adolescent and adult attachment styles are generally conceptualized as regions in a two-dimensional space (Brennan, Clark, & Shaver, 1998; Fraley & Waller, 1998). One dimension, attachment-related avoidance, reflects the extent to which a person distrusts relationship partners' goodwill, strives to maintain independence, and relies on deactivating strategies for dealing with dangers and threats. The second dimension, attachment-related anxiety, reflects the extent to which a person worries that a relationship partner will not be available in times of need and hyperactivates the attachment system in an attempt to gain the partner's attention, care, and love (Mikulincer & Shaver, 2003). Attachment security is indicated by low scores on measures of both insecurity dimensions. Scores in the other regions of the space indicate attachment insecurity of various kinds, each with its own emotional and behavioral correlates. Throughout this article, we refer to people with secure, anxious, and avoidant attachment styles, or people who are relatively anxious or avoidant. Although the convenient categorical shorthand (secure, anxious, and avoidant) can mistakenly foster typological thinking, we will always be referring to fuzzy regions in a two-dimensional space—a space in which research participants are continuously rather than categorically distributed.

Research supports the claim that a person's attachment style is related to his or her ways of coping with threats. For example, people who score low on both attachment anxiety and avoidance (i.e., those who are relatively secure with respect to attachment) are commonly observed to cope with threats by effectively seeking support from others (Mikulincer & Florian, 1995, 1998; Mikulincer et al., 1993), possess a strong sense of self-efficacy (Collins & Read, 1990; Mikulincer & Florian, 1995), generally trust other people (Bartholomew & Horowitz, 1991; Collins & Read, 1990), and perceive the world as a relatively safe place (Mikulincer & Shaver, 2007).

People who score high on attachment anxiety and/or avoidance (i.e., those who are relatively insecure with respect to

attachment) have developed alternative ways of coping with threats and stress. Avoidant attachment is organized around deactivating strategies of affect regulation, which involve deemphasizing threats and trying to cope with them alone, without seeking help or support from other people (e.g., Fraley & Shaver, 1997; Kobak, Cole, Ferenz-Gillies, & Fleming, 1993; Mikulincer & Orbach, 1995; Shaver & Mikulincer, 2002). Anxious attachment is organized around hyperactivating strategies of affect regulation, which involve overemphasizing threats and becoming very emotional and intrusive or insistent in attempts to gain protection and support from other people (Cassidy & Kobak, 1988; Feeney & Noller, 1990; Mikulincer et al., 2000; Mikulincer, Orbach, & Iavnieli, 1998; Shaver & Mikulincer, 2002). Both of the major insecure attachment strategies tend to cause difficulties in relationships and are often the foci of individual and couple psychotherapy (Cassidy & Shaver, 1999, 2008).

How do these individual differences in attachment style arise? According to Bowlby (1973) and Ainsworth et al. (1978), they are shaped by interactions with one's attachment figures across the life span, but especially in childhood. Interactions with attachment figures who are available and responsive contribute to a core dispositional sense of *attachment security*. However, when attachment figures are not reliably available and supportive, a sense of security is not attained and secondary strategies of affect regulation come into play. According to Bowlby (1973), interactions with rejecting and unsupportive attachment figures push a child toward one or another attachment strategy, which is characterized by particular mental representations of self and attachment figures called *internal working models* (Bretherton & Munholland, 2008). These working models allow a person to predict future interactions with attachment figures and activate generally reliable strategies for interacting with them that do not require rethinking or initiating a particular set of strategic actions each time they seem relevant to a situation.

Research has shown that these individual differences are transmitted from parents to children in what van IJzendoorn (1995) called "the intergenerational transmission of attachment" (p. 387). High rates of concordance (between 60% and 85%) have been found, for example, between a mother's state of mind with respect to attachment (as measured by the Adult Attachment Interview; Hesse, 2008) and her child's degree of security or insecurity in her presence in a laboratory assessment procedure called the Strange Situation (Ainsworth et al., 1978; Benoit & Parker, 1994; Fonagy, Steele, & Steele, 1991; Hesse, 2008). According to Main, Kaplan, and Cassidy (1985), the quality of parent-child interactions mediates this intergenerational transmission of attachment. That is, parents' attachment working models shape their caregiving behavior and affect their ability and willingness to provide a safe haven and secure base for their child, which in turn contributes to the child's attachment security. However, van IJzendoorn's (1995) meta-analysis of 10 studies revealed what he called a "transmission gap." Although there was a sizeable mean effect size linking a secure parental state of mind with respect to attachment and

sensitive responsiveness to children's needs and signals during parent-child interactions, much of the association between parent's and child's attachment status seemed to occur through processes other than the quality of parental-child interactions, at least as this has been measured to date.

The transmission gap opened the door to possible genetic explanations of intergenerational transmission of attachment patterns, which challenged Bowlby's (1969/1982) almost exclusive emphasis on the importance of early social experiences. And of course, genetic transmission could have played a role even if there had been no transmission gap, because the similarity between a parent's and his or her child's attachment security could have been based partly on shared genes. Behavioral genetic studies that have assessed concordance of attachment patterns in monozygotic and dizygotic twins have indicated that genetic factors can explain between 14% and 40% of the variance of attachment patterns at various phases of the life span (e.g., Brussoni, Jang, Livesley, & MacBeth, 2000; Crawford et al., 2007; Finkel & Matheny, 2000; O'Connor & Croft, 2001). Studies exploring possible molecular genetic markers associated with attachment patterns have shown that different attachment patterns are somewhat related to particular genetic alleles (e.g., Donnellan, Burt, Levendosky, & Klump, 2008; Gillath, Shaver, Baek, & Chun, 2008). However, other studies have failed to find a strong, direct genetic contribution to attachment patterns (e.g., Bakermans-Kranenburg & van IJzendoorn, 2004) and have instead found evidence for an interaction between genetic and parenting influences.

The Attachment Theory Paradox

One of the most frequently replicated findings in attachment research concerns the distribution of attachment orientations in infancy, childhood, adolescence, and adulthood. Approximately 33% of infants, children, adolescents, and adults exhibit insecure attachment patterns. For instance, using the Strange Situation testing procedure for infants, numerous researchers in the United States (see reviews in Grossmann, Grossmann, & Waters, 2005), Germany (e.g., Beller & Pohl, 1986; Grossmann, Grossmann, Huber, & Wartner, 1981), Japan (e.g., Miyake, Chen, & Campos, 1985), Sweden (e.g., Lamb, Hwang, Frodi, & Frodi, 1982), the Netherlands (e.g., van IJzendoorn, Goossens, Kroonenberg, & Tavecchio, 1985), Indonesia (e.g., Zevalkink, Riksen-Walraven, & Van-Lieshout, 1999), and Israel (e.g., Sagi et al., 1985) have found that, on average, the distribution of infants is roughly 65% secure, 20% avoidant, and 15% anxious (see review in van IJzendoorn & Sagi, 1999). In a meta-analysis of almost 2,000 Strange Situation classifications from 32 samples in eight countries, van IJzendoorn and Kroonenberg (1988) showed that cross-cultural differences in attachment distributions were relatively small. Studies conducted with adolescents and adults have found similar distributions of attachment patterns using both self-reports scales (e.g., Feeney & Noller, 1990; Hazan & Shaver, 1987; Mikulincer, Florian, & Tolmacz, 1990) and the Adult Attachment Interview (see Hesse, 2008, for a review).

Although more than 2 billion people worldwide apparently have an insecure attachment style, theoretical proposals regarding possible adaptive functions of such patterns are scarce (e.g., Belsky, 1997, 1999; Belsky et al., 1991; Simpson & Belsky, 2008). By far, most of the research has focused on the disadvantages of secondary attachment strategies. For example, research examining individual differences in attachment orientations has linked avoidant attachment with fear of intimacy and a tendency to maintain distance in close relationships, pessimistic beliefs about relationships, proneness to sexual infidelity in relationships (Brennan, Shaver, & Tobey, 1991), and a high rate of relationship dissolution (see Mikulincer & Shaver, 2007, for a review). Avoidant individuals disapprove of and avoid self-disclosure (e.g., Mikulincer & Nachshon, 1991), are susceptible to sudden and erratic religious conversions (e.g., Kirkpatrick & Shaver, 1990), and are judged by their peers to be unusually hostile (e.g., Kobak & Sceery, 1988). They prefer to work alone and use work as an excuse for avoiding close relationships (e.g., Hazan & Shaver, 1990). They are more likely than less avoidant individuals to report that they have or had poor relations with their parents while attending college (e.g., Rothbard & Shaver, 1994; Shaver & Clark, 1994). They attempt to cope with stress by ignoring or denying it (e.g., Dozier & Kobak, 1992) or by using alcohol and other substances to reduce tension (e.g., Brennan et al., 1991). Following stressful periods, they are more likely than nonavoidant individuals to exhibit psychosomatic symptoms (e.g., Mikulincer et al., 1993). They are somewhat pessimistic and cynical about long-term relationships (e.g., Carnelley & Janoff-Bulman, 1992) and are less compassionate and altruistic than their less avoidant peers (Mikulincer & Shaver, 2005).

Individuals who are anxious with respect to attachment also contend with many problems and disadvantages, such as an obsessive preoccupation with romantic partners' interest, loyalty, and responsiveness; jealousy; a tendency toward fear, anxiety, and loneliness (even when involved in a relationship); low and unstable self-esteem (e.g., Collins & Read, 1990; Feeney & Noller, 1990); and a higher than usual rate of relationship dissolution (e.g., Hazan & Shaver, 1987). Such individuals are excited about leaving home and going to college, but they become socially dissatisfied and lonely after the first semester (e.g., Hazan & Hutt, 1993). In addition, they prefer to work with others but feel unappreciated and misunderstood at work and tend to daydream about success and slack off after receiving praise (e.g., Hazan & Shaver, 1990). They become very emotional under stress and are forced to use ineffective emotion-focused coping strategies (e.g., Mikulincer et al., 1993). They report more physical and psychological symptoms (e.g., Fiala, 1991; Hazan & Shaver, 1990). They worry about rejection during interactions (Tidwell, Reis, & Shaver, 1996) and indiscriminately self-disclose too much, too soon (e.g., Mikulincer & Nachshon, 1991). They tend to be argumentative, intrusive, and overly controlling (e.g., Kunce & Shaver, 1994).

Both kinds of insecure attachment have been associated with various forms of psychopathology, such as depression (e.g., Carnelley, Pietromonaco, & Jaffe, 1994), anxiety (e.g.,

Bartholomew, 1990; Riskind et al., 2004; Safford, Alloy, Crossfield, Morocco, & Wang, 2004; Williams & Riskind, 2004), obsessive-compulsive disorder (e.g., Doron & Kyrios, 2005), and eating disorders (e.g., Friedberg & Lyddon, 1996). Conversely, a secure attachment style seems to buffer a person against various risk factors (Mikulincer & Shaver, 2007; Thompson, 2008). Self-reports of attachment security are associated with increased perceptions of self-efficacy, positive affect, and reliance on problem-solving coping strategies for dealing with personal and interpersonal stressors (e.g., Birnbaum, Orr, Mikulincer, & Florian, 1997; Collins & Read, 1990; Lussier, Sabourin, & Turgeon, 1997; Mikulincer, 1998; Mikulincer & Florian, 1998).

Although a great deal of research has documented the disadvantages of high levels of attachment anxiety or avoidance, a closer examination of these insecure tendencies suggests possible adaptive advantages under special conditions. Indeed, evolutionary theory suggests that anything as pervasive in the population as insecure attachment is likely to have an adaptive function. In his analysis of variability in scores on the Big Five personality traits, for example, Nettle (2006) argued that such variability can be understood in terms of trade-offs among different fitness benefits and costs. According to Nettle (2006), “behavioral alternatives can be considered as trade-offs, with a particular trait producing not unalloyed advantage but a mixture of costs and benefits such that the optimal value for fitness may depend on very specific local circumstances” (p. 625). Thus, although low levels of extraversion and agreeableness and high levels of neuroticism are typically viewed as imposing important adjustment costs, they can also make important contributions to fitness, which preserves genetic variations in these traits. In terms of Nettle’s analysis, introversion has fitness benefits related to avoiding physical risks and maintaining family stability, neuroticism may be beneficial by causing a person to be vigilant with respect to danger, and low agreeableness may be beneficial in making a person less subject to others’ dishonesty while giving the person a selfish advantage. Following this line of argument, it seems worthwhile to consider possible fitness benefits of attachment anxiety and avoidance.

Belsky’s Evolutionary Analysis of Attachment Insecurity

Belsky and colleagues (Belsky, 1997, 1999; Belsky et al., 1991; see also Chisholm, 1996; Simpson & Belsky, 2008) were the first to address the possibility that there are potential adaptive benefits of insecure attachment styles under particular environmental conditions. For example, they stated as follows:

Attachment behavior would not have evolved if it had only functioned to protect the child and thereby to promote survival, because survival per se is clearly not the goal of natural selection. . . . Thus variations in attachment security that Bowlby’s theory so clearly anticipated evolved to serve reproductive fitness goals in an ecologically sensitive manner. (Belsky, 1999, p. 142)

In other words, Belsky and associates proposed that the potential to develop different attachment patterns evolved because they promote reproductive fitness under certain ecological conditions. Whereas classical attachment theory emphasized the survival function of the attachment system, Belsky (1999) argued that modern evolutionary thinking focuses on reproductive fitness and that insecure attachment strategies may be reproductively advantageous under certain conditions.

This argument is based on Symons’s (1987) suggestion that the adaptive functions of all morphological, physiological, and psychological attributes are ultimately in the service of genetic reproduction. However, Symons did not argue that all of these attributes evolved because they directly promoted reproduction. Although the final goal is reproduction, many morphological, physiological, and psychological attributes evolved because they solved a specific problem of survival. They promote reproduction by enabling an organism to reach a life stage in which successful reproduction and rearing of offspring are possible.

Belsky argued that humans evolved in a way that allows them to modify their reproductive behavior (i.e., mating strategies) in the service of fitness and in accord with ecological conditions. For instance, when resources are limited and unpredictable, parents may unintentionally provide insensitive and unreliable care to their children. In such cases, children may develop avoidant attachment strategies. When they become adolescents or adults, they may pursue a reproductive strategy that emphasizes mating (and procreation) over parenting. That is, by encouraging quantity over quality of offspring, avoidant attachment may indirectly promote reproductive fitness in an unstable, insecurity-arousing environment. Belsky (1999) made the following comment:

Since the risks to progeny’s eventual reproductive success were great and uncontrollable [when the flow of resources was chronically low or unpredictable], the way to ensure that some [children] would survive to reproduce would involve the production of many offspring, even if they were not going to be well cared for. (p. 154)

The adaptive advantage of avoidant people is that they pursue disproportionately self-serving, opportunistic sexual matings and therefore are likely to have multiple mates and many children—some of whom, even if poorly cared for, may go on to reproduce in turn.

With regard to attachment anxiety, Belsky argued that because “whining dependency” (1999, p. 156) is costly to parents, this pattern could have evolved only if it offered a biological pay-off for the parents as well as the child. He reasoned as follows:

The capacity for developing resistant [i.e., anxious] attachments evolved as a means of fostering indirectly reproductive “helper-at-the-nest” behavior. That is, by inducing helpless dependency in a child, inconsistently responsive parenting

evolved to promote a reproductive strategy designed to facilitate the direct reproductive success of kin (especially parents), and thereby the indirect reproductive success of the resistant [anxious] individual. (p. 156)

The adaptive advantage of anxious individuals, according to this argument, is that rather than leave the family home to reproduce, they may stay and help other family members give birth and raise children, thereby increasing the likely survival and successful reproduction of kin with whom they share genes.

Recently, Del-Giudice (2009) broadened Belsky's theory and suggested an integrated evolutionary model of the development of attachment and human reproductive strategies. He argued that early psychosocial stress and attachment insecurities cause a developing individual to pursue reproductive strategies focused on mating effort and early reproduction (rather than investing in long-term relationships and parental investment, which is the strategy associated with early attachment security). Due to sex differences in trade-offs between mating and parenting, insecure males tend to adopt avoidant strategies and insecure females tend to adopt anxious strategies. Studies that support Del-Giudice's (2009) analysis show that avoidant men tend to exhibit what Bartholomew and Horowitz (1991) called dismissing avoidance, whereas avoidant women tend to exhibit fearful avoidance. But there are many other studies that found no gender differences in scores on measures of adult attachment (see Mikulincer & Shaver, 2007, for a review).

Although Belsky took an important first step in attempting to provide an adaptationist analysis of insecure attachment, there are reasons to challenge his basic assumptions. First, recent theoretical analyses and empirical studies in evolutionary psychology suggest that psychological mechanisms exist in their current form because they helped to resolve specific problems of individual survival or reproduction (Buss, 1995; Tooby & Cosmides, 1990). The fear system, for example, including the fight or flight response, is an example of a psychobiological system that evolved because it helped resolve a specific problem threatening individual survival. Fighting or fleeing from a predator probably did not, and still does not, serve immediate reproductive goals, but it may make reproduction possible by increasing the chances of survival to reproductive age.

According to Bowlby's (1969/1982) theory, the attachment system is closely related to the fear system: It is activated by threats, and the behavioral output of the system is generally adaptive because it increases the likelihood of survival. If human infants were not interested in and able to signal urgent needs and desires for help and protection, they would die long before sexual reproduction became a primary interest. Consider, for purposes of comparison, the disposition to fear snakes (Marks, 1987). It presumably exists in humans and nonhuman primates because it contributed to the solution of a specific problem of survival in primates' ancestral environments. The fear of snakes is triggered only by a narrow range of inputs, such as long, sliding organisms perceived to be within striking

range. Once a snake is perceived to be dangerous and within striking distance, this information causes an increase in autonomic arousal, which is part of a flight response that would have protected early humans from deadly snake bites.

The attachment system is also triggered by a fairly narrow range of inputs (which Bowlby, 1973, p. 138, called "natural clues of danger"), which produce a limited set of behavioral outputs (proximity maintenance, signaling a desire to be picked up, and hugging and clinging). These cues continue to activate the attachment system across the life span (e.g., Mikulincer et al., 2000; see Mikulincer & Shaver, 2007, for a review). Thus, survival rather than immediate reproduction seems to be the major reason for the evolution of an attachment behavioral system.

Also relevant to evaluating Belsky's and related theories are studies of sex differences. According to evolutionary psychology, differences between males and females are expected in domains in which they have recurrently faced different adaptive challenges. Conversely, in domains in which the sexes have faced the same adaptive problems, no sex differences are expected (Buss, 1995). In the course of evolution, men and women have faced different problems pertaining to mating (Buss, 1999). Therefore, we would expect there to be sex differences in mating strategies and in attachment strategies if attachment behaviors evolved because they directly promoted sexual reproduction. In fact, however, although there are sex differences in mate preferences (Buss, 1989), courting strategies (Buss, 1988a, 1988b; Tooke & Camire, 1991), jealousy (Buss, Larsen, Westen, & Semmelroth, 1992), and mate-guarding tactics (Buss, 1988a; Flinn, 1988), there are not reliable, general sex differences in attachment strategies (although, as mentioned already, there may be gender differences in the prevalence of dismissing and fearful forms of avoidance).

With regard to jealousy, for example, evolutionary psychologists predicted that the sexes would differ in the kinds of events that activate this intense emotion (Daly, Wilson, & Weghorst, 1982; Symons, 1979). Because of concealed ovulation and the fact that fertilization and gestation occur internally in women, men have faced an adaptive problem not faced by women—having less than 100% certainty of biological parenthood. The reproductive threat for men comes from the possibility of sexual infidelity on the part of a female mate. In species such as ours, in which a man sometimes invests heavily in a woman and her children, the woman's certainty of genetic parenthood is not compromised if her mate has sex with other women. However, the woman may risk the loss of her mate's time, attention, commitment, involvement, protection, and resources—resources that can be diverted from her and her children to another woman. For these reasons, evolutionary psychologists predicted and have generally found that the triggers of jealousy in men would be related to the sex act *per se*, whereas for women the main issue would be loss of a man's commitment and investment (but see Harris, 2003, for a critical evaluation of this literature).

Lack of consistent sex differences in attachment patterns does not fit with the thrust of Belsky and colleagues' arguments, because differences between males and females would

be expected if attachment styles (or the potential for insecure attachment styles under certain ecological conditions) evolved directly, or mainly, to promote reproduction. Instead, the general lack of consistent sex differences in attachment style are consistent with Bowlby's (1969/1982) idea that all human beings, male and female alike, have faced the adaptive problem of being born immature and needing care and protection from attachment figures.

It is important to note, however, that some studies have found an association between avoidant attachment and short-term mating strategies (Schmitt, 2005). Likewise, some studies have found that anxiously attached people continue to perceive their parents as their primary attachment figures later in life as compared with secure and avoidant people (Feeney, 2004). This finding might seem to support Belsky's (1999) suggestion that anxious adults are more likely to be "helpers in the nest." In his words, "It is usually only where there is some biological 'payoff' for the parent as well as for the child that we should expect a parentally influenced and costly pattern of child functioning to evolve" (p. 156). However, other studies (B.D. Carpenter, 2001; Cicirelli, 1993; Crispi, Schiaffino, & Berman, 1997; Eberly & Montemayor, 1998, 1999; Townsend & Franks, 1995) indicate that anxiously attached people are less concerned with the well-being of their parents and show lower willingness to care for them. In other words, anxiously attached people may be in the nest longer, but not necessarily because they are inclined to be helpers in the nest.

Looking for Other Adaptive Advantages of Secondary Attachment Strategies

Hundreds of individual-difference studies have not found adaptive advantages of insecure attachment styles (Mikulincer & Shaver, 2007), except possibly for the ones that Belsky and his colleagues focused on. The reason for failing to see adaptive benefits of insecurity may be twofold. First, contemporary researchers have focused on what counts as individual mental health in a modern society, more or less assuming that this state of mental health has always been an adaptive advantage. There has not been much reason to consider adaptive advantages of what is currently viewed as maladaptive behavior in modern, industrialized, and urban societies. Second, studies motivated by attachment theory may have concentrated too exclusively on one level of analysis, that of individual well-being, mating, and reproduction. Here, we consider the possibility that some of the evolutionary advantages reside at the group level and concern survival rather than mating and reproduction (which of course depend on survival). As Bowlby (1969/1982) said, "From a new viewpoint a familiar landscape can sometimes look very different" (p. 1).

We base our argument on Hamilton's (1964) kin selection theory while also taking Sober and Wilson's (1998) multilevel selection theory into account. Hamilton tried to overcome one of the biggest stumbling blocks for Darwin's theory of evolution: In the evolutionary struggle for reproductive fitness, why do some organisms forgo reproduction while assisting the

reproductive efforts of kin? Hamilton proposed that the individual's total (inclusive) fitness depends on his or her own reproductive output plus the total reproductive output of kin who share the individual's genes. Moreover, in 1975, Hamilton realized that many social traits (e.g., altruism) may be selectively disadvantageous at the individual level but might have evolved nevertheless because families and groups containing members with these social traits could contribute more to the total gene pool than other kinds of families and groups (Hamilton, 1975). In other words, between-group selection may favor certain social traits, even though they are disadvantageous at the individual level (Sober & Wilson, 1998; Wilson, Vugt, & O'Gorman, 2008; Wilson & Wilson, 2007; but see Dawkins, 1994, for an early critical evaluation of multilevel selection theory). For our purposes, the evolution and maintenance of multiple attachment styles could be considered a consequence of either inclusive fitness or multilevel selection or a combination of the two.

In the course of evolution, humans lived in small, highly interactive groups of kin, and humans are unique among mammals in the duration and complexity of the social relationships they form. Because social solutions to adaptive challenges were so crucial for human survival, many of our psychological mechanisms undoubtedly evolved to support this aspect of human existence (Buss, 1995). Brewer and Caporael (1990), as well as other scholars (e.g., Alexander, 1987; Axelrod, 1984; Cosmides, 1989; Gazzaniga, 2008), have argued that living in cooperative groups was the primary survival strategy for humans. This raises the possibility that different attachment orientations, or the facultative potential to develop such orientations under certain environmental conditions (Belsky, 1999; Chisholm, 1996; West-Eberhard, 2003), might have contributed to inclusive fitness because they are advantageous for multiple members of a group, extended family, or small tribe. All of the major attachment patterns—secure, anxious, and avoidant—may promote inclusive fitness in their own ways. As we explain more fully below, the secure pattern may be associated with a balanced, sensible, somewhat altruistic coordination and leadership of group responses to challenges and threats. The avoidant pattern may be associated with quick, independent responses to threat, which may at times increase the survival chances of group members by solving the survival problem or demonstrating ways to escape it. The anxious pattern may be associated with sensitivity and quick detection of dangers and threats, which alert other group members to danger and the need for protection or escape.

Our analysis is based on the following three proposals:

1. Secure and insecure attachment styles may have both unique adaptive advantages (which increase inclusive fitness) and disadvantages (which decrease inclusive fitness; see Hamilton, 1964, for other examples of such mixtures).
2. Different attachment patterns, by virtue of their associated internal working models and action tendencies or behavioral scripts, may have different benefits for group members under threatening conditions. Specifically,

individuals who are relatively high in attachment anxiety may be characterized by what we will call *sentinel reactions and scripts*, and individuals who are relatively high on avoidant attachment may be characterized by what we will call *rapid fight-flight reactions and scripts*.

3. An extended family or tribal group that is heterogeneous with respect to attachment orientations, like groups that are heterogeneous in other respects (see Nettle, 2006), may be more effective in dealing with threats and survival problems than a homogenous group or society.

These three propositions, when fleshed out in the next section, constitute what we call social defense theory (SDT).

SDT

SDT postulates that each attachment orientation—secure, anxious, or avoidant—has both unique adaptive advantages for increasing the inclusive fitness of individuals in a group and unique disadvantages that decrease inclusive fitness (see Nettle, 2006, for related ideas about variations in personality). According to the theory, each attachment orientation includes a working model, or script, that is especially available under threatening conditions. This script renders an individual likely to act in a manner consistent with his or her attachment style.

According to Markus (1977), every individual perceives the world in ways that are organized by self-schemas, which include mental representations of the person's special abilities, achievements, and preferences. Individuals with self-schemas in a particular domain use them to make quick and confident judgments in that domain, adapt flexibly to different information-processing goals related to the domain, and accurately retrieve information relevant to the domain (e.g., S.L. Carpenter, 1988; Kanagawa, Cross, & Markus, 2001; Markus, 1977, 1980). People are chronically sensitive to schema-relevant stimuli and pay close attention to information pertinent to the schema's domain (Markus & Sentis, 1982). As a result, they are more ready than aschematic individuals to apply relevant abilities and skills when the schema is activated (see Markus, 1983; Markus, Cross, & Wurf, 1990; Markus & Wurf, 1987, for reviews).

Moreover, people who possess a self-schema in a particular domain are better able to predict their future behavior in that domain (Markus, Crane, Bernstein, & Siladi, 1982). Markus and Nurius (1986) called these future-oriented self-conceptions "possible selves." Possible selves are the elements of a self-system that allow an individual to simulate the necessary steps and strategies for accomplishing a certain goal (see Markus et al., 1990; Markus & Ruvolo, 1989, for reviews). Possible selves enable a person to focus attention on specific, task-relevant thoughts and feelings and to organize action (Inglehart, Markus, & Brown, 1989), building a bridge between the current situation and a future outcome (Oyserman & Markus, 1990). The more vivid and elaborate the possible selves, the better the performance, because many of the routines required for performance are already activated, engaged,

and organized by anticipation and simulation (Cross & Markus, 1994).

The same logic applies to attachment orientations, which include self-schemas as parts of internal working models (Bretherton & Munholland, 2008; Waters, Rodrigues, & Ridgeway, 1998; Waters & Waters, 2006). Although the existing literature on attachment tends to emphasize adaptive aspects of secure working models or scripts and maladaptive aspects of anxious or avoidant working models, we are especially interested here in cases in which a secure attachment style has disadvantages for members of a group or community and cases in which insecure attachment styles contribute to group members' survival and promote inclusive fitness.

Possible Disadvantages of Security Attachment

Research on adult attachment has shown that individuals with relatively low scores on attachment anxiety and avoidance (i.e., those who are relatively secure with respect to attachment) provide many advantages to the groups in which they participate. For example, they are generally better than less secure individuals at leading and coordinating group activities (Davidovitz, Mikulincer, Shaver, Ijzak, & Popper, 2007; Rom & Mikulincer, 2003). Also, they spend more time than their less secure counterparts in groups, engage in more group activities, and work more effectively with other group members when solving problems and resolving interpersonal conflicts (Rom & Mikulincer, 2003; Smith, Murphy, & Coats, 1999). According to Mikulincer and Shaver's (2003, 2007) literature reviews, these advantages stem from a sense of security rooted in past supportive experiences with attachment figures. This sense of security is closely associated with core beliefs, such as the belief that the world is a safe place, especially when significant others are present. These optimistic, comforting mental representations promote self-soothing reappraisals of threats, which help secure individuals perform better than insecure individuals in many challenging situations.

However, feelings of security do not always reflect actual physical security. In most everyday situations, a sense of security is beneficial because it reduces anxiety and allows a person to focus fully on the task at hand. This is probably one reason why relatively secure individuals perform better than insecure ones at work (Hazan & Shaver, 1990). In times of actual danger, however, the sense of security may be maladaptive if it causes a person to postpone recognizing the emerging threat. Focusing on an ongoing project irrespective of mounting danger may interfere with taking effective action in an emergency. A quick fight-or-flight response is sometimes necessary to avert disaster, and being good at self-soothing and generating optimistic appraisals in such cases may be counterproductive for both the individual and the group.

Indeed, Bowlby (1973) observed that attachment behavior frequently takes precedence over escape in many species. Later, Mawson (1978, 1980, 2005) showed that the typical human response to danger is to seek the proximity of familiar people and places, even if this means remaining in or even

approaching a dangerous situation (see also Baker & Chapman, 1962; Henderson, 1977; Kinston & Rosser, 1974). Secure individuals may activate schemas and scripts that promote seeking proximity to others (e.g., Mikulincer et al., 2002; Waters & Waters, 2006), even though this is sometimes not the safest strategy. Such proximity-seeking in cases of actual danger may have two disadvantages: slower identification of early signs of danger and slower activation of defensive behavior.

Sime (1983, 1985) examined these disadvantages in a retrospective study of reactions to a fire in a large coastal resort on the Isle of Man, Great Britain, in 1973. Shortly after a fire in which 50 of 3,000 vacationers perished, accounts of 500 survivors were collected through interviews. These accounts suggest that people who were physically closer to significant others (e.g., family members) were less likely to react to ambiguous cues of danger, such as noises and shouts, that occurred during the early stages of the fire. They reacted only later, when unambiguous cues of danger, such as smoke, flames, and people running while holding fire extinguishers, occurred. Subsequent studies of survivors' behavior during disasters also suggest that people who were together with familiar others were slow to react to danger (Aguirre, Wenger, & Vigo, 1998; Fitzpatrick & Mileti, 1991; Perry, 1994; Proulx, 2002, 2003). In the presence of significant others, many people seem to react slower to cues of imminent danger.

Research examining reactions to real or imagined dangers also provides indirect support for the hypothesis that securely attached people react in nonoptimal ways to signs of danger. For example, in October 1938, Orson Welles broadcast a section from the science-fiction book *The War of the Worlds* (Wells, 1938) as if it were genuine news. He dramatically depicted the advance of the Martians as a judgment day for humanity. Cantril, Gaudet, and Herzog (1940) studied the famous broadcast and its outcomes. It appears that many of the people who listened to the broadcast believed what they heard and were frightened, but the vast majority did not flee. Instead they contacted relatives and friends in the city. Most of those who fled did so only after other family members had been brought together. In the devastating Southeast Michigan Flint-Beecher tornado of June 1953, people also tended to turn to and protect loved ones rather than flee from the threat (Form & Nosow, 1958). These findings are not surprising because the attachment system's main tendency and function is to seek proximity as a way of attaining safety (Bowlby, 1969/1982). But proximity seeking in cases of imminent disaster may not be adaptive for individuals or their close relatives.

Bowlby (1973) noted that during and after disasters, "no member of a family is content, or indeed able to do anything else, until all members of the family are gathered together" (p. 91). Studies of behavior during fires also show that people tend to converge and cluster (Bryan, 1985, 2002; Sime, 1983, 1985). Governments and trained professionals have great difficulty getting people to evacuate before and during disasters, because "traditional family ties often keep individual members in the danger zone until it is too late" (Hill & Hansen, 1962, p. 217).

Studies indicate that most people tend to remain in a disaster area (Cantril et al., 1940; Quarantelli & Dynes, 1977), and when they are forced to evacuate, they tend to do so as a group (e.g., Cantril et al., 1940; Freeman & Cooper, 1940) or in family units (Quarantelli & Dynes, 1977), thereby maintaining proximity and contact with familiars. Bettelheim (1960) described how many Jewish families in Holland went into hiding as groups despite the fact that everyone knew they would have a better chance of surviving as individuals.

In his study of the resort fire, Sime (1983, 1985) found that 13 of the 50 people who died were in their groups when alerted about the fire, and the groups "evidently delayed their departure. In trying to escape in groups by whatever route they chose, these people were caught by the encroaching smoke and flames" (Sime, 1983, p. 38). In fact, proximity-seeking behavior seemed to increase the danger to family groups because they were slower to escape and therefore increased the risk of injury and death. Other disaster studies also show that people in their groups are slow to leave disaster areas and instead wait to be evacuated as a group (Aguirre et al., 1998; Fitzpatrick & Mileti 1991; Perry, 1994; Proulx, 2002, 2003).

Taken together, the evidence suggests that although securely attached individuals are better at leading and coordinating group activities, these advantages are partially offset by their slower identification of actual and imminent dangers and their sometimes nonoptimal reactions to danger due to a wish to stay close to other people. In other words, securely attached individuals' action scripts, focused on seeking proximity to others in times of threat, may sometimes hamper their survival and the survival of their group. This suggests that the survival chances of groups composed only of securely attached people might in some important cases actually be lower than the survival chances of insecurely attached people.

Insecure Attachment

Adult attachment research (e.g., Rom & Mikulincer, 2003) has shown that relatively anxious or avoidant individuals often perform less optimally in group activities than do relatively secure ones. They may take the work less seriously, make fewer or poorer quality contributions to a team, and have lower expectations of contributing to the team effort. Nevertheless, in some dangerous situations these individuals may have advantages in escaping or in helping their group members escape to safety.

The Adaptive Advantages of Attachment Anxiety: Mental Schemas Related to Serving as a Sentinel. People who are relatively high in attachment anxiety adopt hyperactivating strategies of affect regulation in times of threat or stress, which heightens the monitoring of threat-related cues and results in exaggerated threat appraisal, almost regardless of the actual threat (Cassidy & Kobak, 1988; Mikulincer et al., 2000; Shaver & Mikulincer, 2002). Moreover, they react to threats by minimizing distance from others, signaling danger, and clinging (Feeney & Noller, 1990; Mikulincer et al., 1998). In this way, these individuals may offset some of the deficiencies of

securely attached group members by reacting quickly and strongly to early, perhaps ambiguous cues of actual imminent danger. For instance, in case of fire, anxiously attached individuals may alert other group members to the first signs of danger (e.g., ambiguous cues such as unusual noises, shuffling feet, or shouts). They may possess schemas and action tendencies that make them good *sentinels*. That is, whenever they become sensitive to a threat, they may call it to other group members' attention sooner than they would attend to it on their own.

Many species of animals benefit from having sentinels in their midst. For instance, birds (e.g., Miller, 2005; Platzen & Magrath, 2005), rodents (e.g., Brudzynski, 2005; Sherman, 1980, 1981), various mammals (e.g., Fichtel, 2004), and primates (e.g., Coss, Ramakrishnan, & Schank, 2005; Riede, Bronson, Hatzikirou, & Zuberbühler, 2005) produce shrill alarm signals when they detect a potential threat. Moreover, since classic studies by Dunford (1977) and Sherman (1977) demonstrated nepotistic benefits to ground squirrels from issue alarm signals, other studies have found that animals obtain both direct and indirect fitness benefits by risking their own safety (e.g., by calling a predator's attention to them) while signaling their associates of danger (e.g., Blumstein, Steinmetz, Armitage, & Daniel, 1997; Hoogland, 1995, 1996; Schwagmeyer, 1980). In other words, the existence of sentinels in a group often enhances the survival chances of group members.

In similar ways, human group members can benefit from anxiously attached individuals' hyperactivating strategies. In the course of evolution, humans lived in relatively small groups or tribes of kin, so anxiously attached individuals might have increased their own inclusive fitness by being sentinels while also enhancing their group's overall contributions to the gene pool. That is, heterogeneous groups that included some members who were anxiously attached might have been more successful in terms of both survival and reproduction than might groups composed entirely of secure individuals. By making these arguments, we are not implying that anxiously attached individuals always behave as sentinels, whereas secure and avoidant people do not. We suggest only that the probability of identifying threats and calling other people's attention to them is higher for anxious individuals than for secure or avoidant people.

The existence of this pattern could be due either to genes that contribute to its formation or to genes that allow it to be developed in response to environmental conditions. As the developmental research literature on attachment shows that anxious attachment develops when primary attachment figures are themselves anxious and unreliable (perhaps by being sensitive to threats and oriented toward their own self-protection), it should be more common, as Belsky (1999) argued (although for different reasons), when the social or physical environment is conducive to parents being anxious and unreliable. This environment is likely to include conditions in which threats (whether from weather, predators, or human conflicts and wars) are prevalent but unpredictable.

In sum, anxious attachment and its relation to sentinel behavior may have been adaptive at the group level, given that (a)

sentinels in other species contribute to the survival of their groups, (b) the early human environment was most probably well supplied with circumstances and predators that threatened humans, (c) in such an environment the benefits of sentinels would have been great, and (d) anxiously attached group members' quick and intense reactions to threats were probably useful to the majority of group members who were more secure and therefore less excitable. Their anxious schemas and action tendencies, while possibly being troublesome at times, would have nevertheless been beneficial at other times to group members' survival and eventual reproduction.

The Adaptive Advantages of Avoidant Attachment. Individuals who are relatively avoidant with respect to attachment are accustomed to looking out for their own interests and taking care of themselves, even if this sometimes occurs at others' expense (Mikulincer & Shaver, 2007). This means that they are likely to rely on self-protective fight-or-flight reactions in times of danger. This defensive pattern has both disadvantages and advantages. In the face of danger, avoidant individuals may be primarily motivated to save themselves, but this tendency may allow them to quickly discover a way to do so. Meanwhile, anxiously and securely attached individuals may focus much of their attention on the whereabouts and welfare of close associates without focusing quickly and fully on how to escape.

Imagine an avoidant person in the presence of a dangerous fire (of the kind we mentioned earlier). While taking quick protective action, the person may find an escape route or take effective action to put out the fire or seal a door to keep the fire outside. Moreover, the avoidant person may be personally effective and perhaps even ruthless if the situation calls for it; he or she is not overwhelmed by emotion when drastic action is required. Although there are obvious moral dangers in behaving this way, there is little doubt that it can increase an avoidant person's survival chances while sometimes saving other people's lives, including the lives of group members about whom the avoidant individual may not care very deeply. Saving lives is likely to contribute to the avoidant person's inclusive fitness (keeping in mind that humans for most of their existence have lived in groups of kin) and to the group's overall fitness.

Evidence for the influence of a few group members' early decisions to flee a dangerous situation can be found in the research literatures on military situations and natural disasters. One of the most alarming sights for human beings is other people running from danger (e.g., Mawson, 1980). Marshall (1947) eloquently stated the following in writing about military behavior during World War II:

It can be laid down as a general rule that nothing is more likely to collapse a line of infantry than the sight of a few of its number in full and unexplained flight to the rear. . . . One or two or more men made a sudden run to the rear which others in the vicinity did not understand. . . . In every case the testimony of all witnesses clearly [indicated] that those who started the

run . . . had a legitimate or at least a reasonable excuse for the action. (pp. 145–146)

It is also known that in dangerous situations people tend to follow the route they see others taking (Mawson, 1980).

Individuals who flee first (those, we suggest, who are likely to be disproportionately avoidant) often clear a way by opening emergency doors, breaking a window, or finding a safer place to hide. When their escape route is identified and cleared, others can follow and take advantage of the escape route. Thus, avoidant individuals may increase their own and their group members' chances of survival under emergency conditions. As in the case of anxiously attached individuals acting as sentinels, a group that contained at least some avoidant members might benefit from their presence even if the same individuals at other times caused difficulties (e.g., engaging in mate poaching or being irresponsible as parents; Schachner & Shaver, 2004).

Also as in the case of anxious attachment, the existence of the avoidant attachment pattern could be due either to genes that contribute directly to its formation or to genes that allow it to develop under certain environmental conditions. As the developmental research literature on attachment shows that avoidant attachment develops when primary attachment figures are themselves emotionally restricted, highly independent, and somewhat selfish, it should be more common, as Belsky (1999) argued, when the social or physical environment makes selfishness and independence useful for survival. This environment is likely to include conditions in which altruism, including generous parental behavior, and interdependence interfere with survival. In a cross-cultural study of 55 countries, Schmitt et al. (2004) found that avoidant adult attachment is most common in Africa, where mortality due to disease, famine, and war is exceptionally high, sometimes making warm, secure relations with other people less rather than more conducive to survival.

In sum, diversity of attachment patterns in human groups, tribes, and societies may have been adaptively advantageous over the span of human evolution. Although securely attached individuals may provide better care for their children and may be generally more effective than anxious or avoidant individuals at leading and coordinating groups (Davidovitz et al., 2007; Rom & Mikulincer, 2003), they may also be slower than anxious individuals to notice signs of impending danger and slower than avoidant individuals to show group members how to escape danger.

An implication of this analysis is that an extended family or tribal group that is heterogeneous with respect to attachment styles should be better, on average, at dealing with threats and survival problems than should homogenous groups. Heterogeneous groups should have the ability to detect potential problems and threats (with anxious group members acting as sentinels); the ability to act quickly without much deliberation, negotiation, and compromise (with avoidant people acting as models of quick self-protection); and the ability to manage complex social tasks (with securely attached people acting as stable leaders and coordinators of the group). Each of these

behavior patterns may promote the inclusive fitness of group members in its own way (see also Nettle, 2006). In an unpublished and generally overlooked dissertation study of real-world work teams, Kimmel (2003) found that teams containing only securely attached individuals were less effective in accomplishing group tasks than were work teams containing only 75% or 50% securely attached individuals, with the remaining team members having insecure attachment styles.

Preliminary Evidence Supporting SDT

Using SDT's basic postulates, we derived three key predictions that we have begun to test empirically. First, at the cognitive level, attachment-anxious and attachment-avoidant people will be characterized by greater cognitive accessibility to sentinel and rapid fight–flight scripts. Moreover, anxious individuals will have more rapid access to sentinel scripts (indicated by a low threshold for detecting danger and a high propensity to alert others), whereas avoidant individuals will be characterized by greater accessibility of rapid fight–flight scripts (indicated by a high propensity to think immediately of ways to escape dangerous situations, mainly with the goal of saving themselves). Second, at the behavior level, anxious and avoidant people will differ in the way they behave in threatening situations. Whereas the more anxious individuals will quickly identify threats and alert others to them, avoidant people will show rapid fight or flight responses without deliberating with other group members or waiting for their decisions. Third, groups that are more heterogeneous with respect to attachment orientations will be more effective in dealing with threats (e.g., resolve emergency situations faster than less heterogeneous groups).

Cognitive Evidence

In a series of five studies, Ein-Dor, Mikulincer, and Shaver (2009b) have examined attachment-related variations in the cognitive accessibility of sentinel and rapid fight–flight scripts. In the first study, researchers asked participants to examine a picture of a small group of people in a threatening situation and write a story about what would happen next. Judges blind to participants' attachment scores received explanations about the sentinel and rapid fight–flight scripts and were trained to code each story according to specific and well-defined criteria (e.g., noticing threat before others, warning others about the threat, acting without receiving help from others, reacting quickly without depending on others' actions). As we predicted, participants scoring higher on attachment anxiety were more likely to generate stories that were congruent with the sentinel script. Likewise, participants scoring higher on avoidant attachment were more likely to generate stories that included the main components of the rapid fight–flight script. It is important to note that these associations were statistically significant even after we controlled for broad personality traits, socially desirable response biases, and verbal ability.

In the second and third studies, Ein-Dor et al. (2009b) examined attachment-related variations in memory for core components of either the sentinel script (Study 2) or the rapid fight-flight scripts (Study 3). Previous studies have shown that having a well-developed and highly accessible schema for a particular domain speeds up recognition of schema-relevant information encountered in a previous learning task and increases false recognition of schema-relevant information that did not actually appear in the learning task. Both of these patterns are indications of schema-biased information processing (e.g., Lurigio & Carroll, 1985; Markus, 1977; Roediger & McDermott, 1995). We hypothesized that having a well-developed and highly accessible sentinel script would cause attachment-anxious people to quickly recognize real script-relevant information and produce more false memories for items that might have occurred in the learning task but actually did not. Similarly, having a well-developed and highly accessible rapid fight-flight script would cause avoidant people to quickly recognize and falsely recall information relevant to that script.

Participants were shown a video clip of a young woman answering threat-relevant and threat-irrelevant questions. They then performed a recognition task related to her answers. For half of the participants, the target woman's answers to threat-relevant questions were congruent with either the sentinel script (Study 2) or the rapid fight-flight script (Study 3). For the remaining participants, the target woman's answers were incongruent with both of these scripts. In the recognition task, participants received statements that had appeared among the target woman's answers (old items) and statements that resembled the target woman's answers semantically but had not actually been among her answers (new items). In this task, participants were asked to decide whether or not each of these statements had actually appeared in the video clip. For each participant and each sentence category (neutral, threat), we calculated two scores: the percentage of trials in which old sentences were accurately recognized ("hits"), and the percentage of trials in which new sentences were incorrectly believed to have appeared in the video clip ("false memories"). We also calculated average reaction times (RTs) for "hits" and "false memories."

In line with predictions, attachment anxiety, but not avoidance, was significantly associated with more schema-biased memories and faster recognition of information that was congruent with the sentinel script. Similarly, as predicted, avoidant attachment, but not anxious attachment, was significantly associated with more schema-biased memory and faster recognition of information that was congruent with the rapid fight-flight script. When the information in the video clip was not congruent with the rapid fight-flight script, more avoidant participants reacted with less schema-biased memory.

In the fourth and fifth studies, Ein-Dor et al. (2009b) examined attachment-related variations in the processing of information relevant to either the sentinel script (Study 4) or the rapid fight-flight script (Study 5). Markus, Smith, and Moreland (1985) showed that a well-developed schema provides a

cognitive framework for going beyond the schema-relevant information given. Specifically, they found that having a well-developed schema for a particular domain enables people to generate more impressions of and conjectures about the thoughts, feelings, intentions, and traits of a story's protagonist—information that was not explicitly presented in the story. We similarly hypothesized that anxious individuals' well-developed sentinel script would allow them to process information relevant to the sentinel script in a deeper fashion, whereas avoidant individuals' well-developed rapid fight-flight script would allow them to process information relevant to this script in a deeper fashion.

Participants were asked to read a story that included the major components of either the sentinel script (Study 4) or the rapid fight-flight script (Study 5). They then generated recollections (actual facts presented in the story) and impressions (inferences, feelings, and opinions) about the story. Two independent judges placed each participant's responses into one of the following categories: script-relevant recollections, script-relevant impressions, neutral (script-irrelevant) recollections, and neutral impressions. The results indicated that attachment anxiety, but not avoidance, was associated with generating more inferences concerning the sentinel script. However, it did not explain individual differences in the number of sentinel-script recollections or the number of inferences made about script-irrelevant statements. Similarly, as predicted, avoidant attachment was associated with generating more inferences about the rapid fight-flight script. However, it did not explain individual differences in the number of rapid fight-flight recollections or the number of recollections or inferences made about script-irrelevant issues. In addition, attachment anxiety was found to impair recall of information congruent with the rapid fight-flight script.

Overall, Ein-Dor et al.'s (2009b) findings suggest that anxiously attached people possess highly accessible and well-organized implicit knowledge about a sequence of events that goes from monitoring and quickly reacting to potential sources of threats to alerting others about the imminent danger and minimizing distance from others. This highly accessible knowledge structure probably contributes to the well-documented tendency of anxiously attached individuals to become highly distressed in face of threats and to cope with all kinds of difficulties by catastrophizing, directing attention to threat-related information, vigorously expressing needs and vulnerabilities, and desperately seeking proximity to others and support and comfort from them (see Mikulincer & Shaver, 2007, for a review).

The findings also suggest that avoidant people possess highly accessible and well-organized implicit knowledge about a sequence of behaviors beginning with rapid efforts to preserve oneself—fight or flight responses—without deliberating or coordinating responses with other people or expecting help from them. This highly accessible rapid fight-flight script may underlie research findings showing that avoidant individuals are reluctant to seek support in times of trouble, keep somewhat distant from and independent of other people, suppress distress-related

thoughts, and emphasize autonomy and self-efficacy (see Mikulincer & Shaver, 2007, for a review).

Behavioral Evidence

In an initial test of SDT's behavioral predictions concerning behavior in groups, Ein-Dor, Mikulincer, and Shaver (2009a) asked Israeli undergraduates to complete the ECR scale at the beginning of the semester and then assessed their actual behavior during an experimentally induced threatening situation in a small-group laboratory situation. Participants were invited to the laboratory in groups of three (46 groups in all). Upon arrival, an experimenter took the 3 participants to a large room, sat them beside a long table, and asked them to complete a battery of questionnaires while he prepared the computers for the experiment. The experimenter then exited the room and closed the door behind him. Participants were filmed by hidden cameras throughout the session. Ten feet behind the participants' table was another table on which an SVGA monitor displayed a generic desktop graphic; on the floor nearby was an apparently attached PC, which was actually a nontoxic party smoke machine. Exactly 1 minute after the experimenter departed, he began sending smoke into the room through the bogus PC computer, making it seem to participants that the computer had caught on fire. The experiment ended when the participants either exited the room or tried to deal with the smoking computer.

Two judges, blind to participants' attachment scores and the SDT hypotheses, recorded the following information: (a) the identity of the participant who was the first to detect the presence of the smoke in the room; (b) the identity of the participant who was the first to react, either by exiting the room or attempting to deal with the danger (whichever came first); (c) the amount of time (in seconds) from turning on the smoke machine to participants' detection of smoke in their room; and (d) the amount of time (in seconds) from the onset of the smoke to the conclusion of the session. In addition, the judges rated the effectiveness of each group in dealing with the situation on a scale ranging from 1 (*not at all*) to 7 (*very much*).

Consistent with SDT predictions, the probability of identifying the presence of smoke in the room was significantly higher for individuals who scored relatively high on attachment anxiety. In addition, the probability of reacting first to the danger was significantly higher for individuals who scored relatively high on avoidant attachment. These associations were still significant after controlling for participants' levels of extroversion and neuroticism. Moreover, more heterogeneous groups in terms of attachment orientations were rated by judges to be more effective in dealing with the dangerous situation and took less time to detect and deal with the danger. Overall, the findings lend impressive initial support for SDT hypotheses—hypotheses that would not have been proposed or tested without SDT.

Concluding Comments

Over the past 20 years, numerous studies have demonstrated the relevance of attachment theory to many psychological and

social processes in adult life. One consistent finding has been that securely attached individuals are happier and better adapted in virtually every area of daily life. This made us wonder why approximately half of the human population is insecure with respect to attachment. It seemed to be an evolutionary paradox. SDT was devised to explain this paradox. It is based on the possibility that attachment patterns that seem troublesome and dysfunctional at an individual or dyadic level make sense when considered at the level of groups, tribes, and societies. At that higher level of analysis, it seems possible that attachment-style heterogeneity is conducive to survival when a group encounters life-threatening dangers. SDT makes empirically testable predictions, and we have already found in the two preliminary studies briefly summarized here that two of SDT's predictions are supported by experimental data. It therefore seems worthwhile to test the theory further.

If SDT continues to receive empirical support, it will be important to determine the best explanation from an evolutionary viewpoint. If a mixture of attachment patterns is useful at the group level, this suggests one or both of two alternative evolutionary accounts. First, it might imply that different attachment patterns are related to different genetic alleles (as already indicated by Crawford et al., 2007; Donnellan et al., 2008; and Gillath et al., 2008), in which case inclusive fitness or group-level selection processes might have determined the relative frequencies of the different attachment patterns in the human population. To date, however, there is little evidence for strong, direct genetic determination of attachment patterns and some evidence against it (see Vaughn, Bost, & van IJzendoorn, 2008, for a review of genetic studies of infant attachment patterns). The second possibility is that evolution generated a capacity for facultative development of attachment patterns in response to environmental pressures. This is the kind of explanation offered by Belsky (1999), although he based his version of the explanation on mating processes rather than survival.

In either case, it will be important to discern why the relative frequencies of the major attachment patterns seem to be similar around the world. If there really is such a general similarity, it suggests either similarities in the average kinds and levels of threats to groups or frequency-based selection (West-Eberhard, 2003). An argument against this proportional constancy is that insecure attachment is more common in lower socioeconomic groups (Steele & Steele, 2008) and, as already mentioned, in environmentally challenging parts of Africa (Schmitt et al., 2004). These considerations suggest that if SDT is supported in future studies, it needs to be developed more fully with respect to alternative biological and evolutionary explanations.

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The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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