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Attachment theory and its vicissitudes: Toward an updated theory

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Jean Mercer
Richard Stockton College

Abstract

This paper attempts first steps toward reworking Bowlby's attachment theory and formulating an updated version. The paper examines 11 tenets of attachment theory as it was originally proposed by Bowlby and colleagues. These tenets are discussed in terms both of historical and recent criticisms, and of relevant research. Reasons are given for why the discussion omits work involving animal models or focused on measurement issues. In conclusion, the tenets are assigned to four categories: ideas that have received little criticism; ideas that have been criticized but are generally accepted, although they need to take new research evidence into account; ideas that have been rejected or questioned more than they have been accepted; and ideas that have been rejected or extensively reinterpreted.

Keywords

attachment, development, personality, social cognition, Theory of Mind

Attachment and attachment theory are mentioned in thousands of academic, clinical, and research-related publications every year. If we include popular publications directed to parents and teachers, the number must reach the tens of thousands. Attachment is discussed in courts of law, and a definition is neither requested nor offered. Psychotherapies of various types are said to be infused with the principles of attachment theory. In most cases, the attachment theory referred to is that suggested in the middle of the 20th century by John Bowlby (e.g., 1982), who created a "grand" theory of the growth of social relationships from infants' experiences with their caregivers and the consequent social preference called attachment. Although not the only possible theory of attachment, Bowlby's theory is the pre-eminent formulation, the approach that has maintained a relatively continuous framework even though some alterations have occurred. This paper will use the term "attachment theory" to refer to Bowlby's theory and views derived from it.

It would seem that there must be some agreed-upon statement or formulation of attachment theory, both in its original Bowlby form and in its present organization. But

Corresponding author:
Jean Mercer, 134 E. Main St., Moorestown, NJ 08057, USA.
Email: jean.mercer@stockton.edu

what is the formulation? A decade and a half ago, Rutter (1995) pointed out ways in which Bowlby's theory had already been revised as a result of discussion and research. It is clear that attachment theory as presently used is different in some ways from Bowlby's original recipe. Nevertheless, there has been no systematic reformulation of ideas about attachment and no distinct statement of the differences between "Bowlby's attachment theory" and, for want of a better term, "current attachment theory" or "attachment theory, vintage 21st century." ("Modern attachment theory" has already been used by J.R. Schore & Schore, 2008, to label a proposed approach that will be discussed later in this paper.)

As E. Waters and Cummings (2000) pointed out some time ago,

> Maintaining the coherence and empirical underpinnings of attachment theory is a continuous process of updating key ideas in light of advances in theory, data, and other areas of psychology, and subjecting the theory to severe tests, tests which, if not passed, would require us to reject the theory, or at least to make significant revisions, thereby influencing subsequent research. (p. 164)

A few years later, Thompson (2005) commented that attachment theory has examined mother–child relationships

> through the prism of Bowlby's original theorizing that has failed to be substantially updated by new knowledge of children's conceptual and psychological growth. … Unless new and updated theoretical insights can guide empirical inquiry into close relationships, we will continue to debate issues concerning mother–child relationships and social networks 20 years from now. (p. 106)

In addition to these issues, Bowlby's attachment theory has been criticized as having been "gradually found to be incapable of generating testable hypotheses that could explain … puzzling observations" (Hofer, 2006, p. 84).

This paper will attempt some small steps toward the updating of attachment theory, by delineating the ways in which it has been criticized and how it has changed as a result. Examples of relevant research findings will also be described, but there will be no attempt to summarize all the studies on this topic. These tasks will be carried out for each of a series of tenets of attachment theory as it was proposed by Bowlby and colleagues in the late 1960s and 1970s (Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1958, 1960, 1982; Hinde, 1982). In conclusion, each of the original tenets will be evaluated in terms of its present appearance of strength or weakness, yielding a picture of attachment theory as it is functioning today, as well as raising some important unanswered questions.

Some problems for the formulation of attachment theory

Defining attachment

What is attachment? What is the actual subject matter Bowlby dealt with, and how has that subject matter changed in the ensuing years? This definition, such a trivial task on the face of it, turns out to be unexpectedly difficult.

Many undergraduate textbooks assert that attachment is an "emotional tie" between child and parent. Although this definition gives some sense of what attachment is about, it is not only oversimplified but also confusing. It is true that attachment has a strong emotional component, but cognitive and behavioral factors are also present. Attachment involves feelings and behaviors that the child shows toward the parent, but recent work on attachment has referred to relational aspects (Zeanah & Smyke, 2008) in which both parent and child characteristics need consideration. Finally, the term "tie" is a metaphor, as Hofer (2006) has acknowledged about the term "bond," and as a metaphor its significance is dependent on the appropriateness of the analogy and the resemblance of attachment to an actual tie or bond.

Bowlby's own approach to attachment emerged from studies of children's responses to long-term separation from their mothers and their subsequent distress, grief, and gradual recovery. Using behavioral and clinical information, he formulated a theory of attachment that included behavioral, motivational, and cognitive components. Although Bowlby's perspective began with a focus on infancy and early relationships, his theory eventually included developmental steps during childhood that created a foundation for aspects of adult personality. Sroufe (1979) elaborated on this broader view and spoke of attachment as an organizing principle that served as a basis for child behavior and for later personality development; this concept encouraged the development of attachment-related research on adult social relationships. However, Sroufe later (1996) defined attachment as "the dyadic regulation of emotion" (p. 172). As Hofer (2006) has noted, the word *attachment* has "found a new usefulness as a general descriptive term for the processes that maintain and regulate sustained social relationships, much the same way that *appetite* refers to a cluster of behavioral and physiological processes that regulate food intake" (p. 84). Many authors (e.g., E. Waters & Cummings, 2000) have focused on toddler attachment behavior as a way to find a "safe haven" when experiencing threat, as well as to use contact with a familiar caregiver as a "secure base" from which to explore and learn.

These functions of attachment involve dyadic emotional regulation, but secure base behavior has additional functions in cognitive development. "Attachment" thus comprises a range of age-related behaviors, emotions, and cognitions.

Developmental issues in the formulation of attachment theory

As was pointed out in the previous paragraph, attachment theory has come to cover a wide developmental range rather than being confined to relationships between infants and their caregivers. This wide range of application creates difficult issues for any theory, as developmental differences in behavior, emotion, and cognition are challenges to any effort to demonstrate the continuity of a characteristic, especially one like attachment that defies direct measurement. One of the knottier problems faced by attachment theory has to do with the fact that the seeking of protection and nurturance by the toddler is thought to be connected to the later giving of nurturance by the same individual at a later period of life, as well as to peer relationships that can include both social and sexual connections. In spite of these difficulties, research on attachment issues has continued to explore both developmental events that precede any obvious attachment behavior

(Greenspan, 1992) and social relationships in later life, such as attachment behaviors and motivations in adolescents (e.g., Soares, Lemos, & Almeida, 2005). However, little work has focused directly on Bowlby's view of attachment development in the preschool and elementary school years, when the earlier period is said to be characterized by negotiation of separation and the later period by the development of goal-corrected partnerships with adults and with peers.

Attachment parallels in humans and non-humans

Can information about non-humans be used to test or adjust a theory about human beings? Is attachment theory, as formulated by Bowlby or in its current form, a theory about human attachment, or does it attempt to cover the much wider topic of relevant social relationships in both humans and non-humans? Bowlby's original formulation of attachment theory involved an ethological model derived primarily from work on non-human subjects.

Research on primate maternal behaviors such as that conducted by Rheingold (1963) demonstrated the existence of behaviors parallel to those of humans in both mothers and infants. However, work on the comparative psychology of social behavior, such as that of Scott (1960), indicated considerable species variation, and described species differences in epimeletic (nurturing) and etepimeletic (soliciting nurture) behaviors. Differences between altricial and precocial species were marked, by definition.

In spite of the extensive evidence for species and even strain variations in maternal and infant behavior, like those described by Trause, Klaus, and Kennell (1982), building theory on non-human evidence remains an attractive possibility to many authors. Hofer (2006), for example, recently suggested that work with rats could answer important questions relevant to human attachment, such as what creates an attachment bond, why early separation is stressful, and how early relationships can have lasting effects. Unfortunately, the existence of serious species differences demands an evaluation of the extent to which the leap from rat to human is logically acceptable.

Hofer's attempt to reason from rat data to human behavior is a use of analogy, and thus may be effective if the two events being analogized are similar in many details. It is less effective if the two events are rather different, yielding a false analogy. Maternal behavior in rats consists of retrieving wandering pups, grooming them, especially through licking the tail end to stimulate elimination, and permitting them to make their way to a nipple, latch on, and nurse. Mother rats also keep the nest clean by eating the afterbirth and any dead pups. Rat pups must be able to find a nipple and suck; they also emit high-pitched squeaks that summon the mother to retrieve them. These are behaviors that Hofer described accurately as regulating the infants' biobehavioral systems. Humans have a parallel but rather different set of maternal and infant behaviors which also have a regulatory function, but because of the highly altricial nature of our species, much more responsibility is placed on the mother. The human infant cannot move toward the breast or move to change nipples in the first months, but mother and child depend on the mother's interpretation of infant signals indicating nourishment needs. The effects of maternal body warmth and milk on rat pups, instanced by Hofer as part of the regulatory system and thus related to attachment, are replaced in humans by other sources of warmth and a

wide variety of nutrititive behaviors. The analogy between rat pups and human infants is less than perfect, although it would be more acceptable if it had been demonstrated that young rats use the mother as a secure base for exploration, or that adults show distress at the death of a pup.

The existence of social differences between species suggests that neither maternal–infant interactions nor other forms of social relations can be counted on to provide a useful analogy between non-human and human behaviors (cf. Emery & von Bayern, 2009). This evidence about species variations suggests that at this point attachment theory is human attachment theory, and is species-specific to humans, rather than a theory that comprises all behavior relevant to all maternal–infant interactions. Data from non-humans can be used to develop hypotheses about humans, but, unless empirically supported, these remain speculative. For these reasons, this paper will not address research on non-humans as it relates to human attachment theory. Naturally, there can be species-specific theories of maternal and related behavior for other species as well as for humans, and these are of serious interest in themselves.

Using research to test attachment theory and related hypotheses

Research problems offer major challenges to the reformulation and testing of attachment theory, although Hofer (2006) probably exaggerated when he said that Bowlby's theory was not capable of generating testable hypotheses. There have been few studies related to attachment theory that were susceptible to randomized designs, and as a result research in this area is plagued with confounded variables such as the effects on development of family characteristics other than child attachment status, or the possible evocative effects of child attachment status on family conflict.

Longitudinal studies. Recent work on attachment issues has included the publication of both longitudinal and epidemiological studies, highly ambitious and potentially useful, but sometimes difficult to interpret. A 30-year longitudinal study (Sroufe, 2005; Sroufe, Egeland, Carlson, & Collins, 2005) began with a sample of over 200 urban mothers who were considered to be at moderate risk for parenting problems because of their poverty. The broad conclusions of this study underscore the complexities of attachment research: that connections between attachment experiences and later characteristics are non-linear; that multiple influences on development mean that additional factors combine with attachment history to yield improved predictions; and that attachment history can have complex results with both direct and indirect effects on later development.

Institutionalized children. The English and Romanian Adoptees study (see Becket et al., 2007) was and is a longitudinal study of formerly institutionalized children who had been severely deprived of social and medical care for months or years and had then been adopted into British families. An extensive series of studies has been investigating aspects of these children's development such as unusual attachment behavior (Rutter et al., 2007), as well as cognitive and language skills as they have changed over time (Becket et al., 2007). Confounding variables hamper the interpretation of this type of research as

they did in the earlier longitudinal study, particularly because there is little information about the reasons for the children's institutionalization and the possibility that poor early development caused placement rather than the opposite.

Interpretation and generalization. With respect to these two large studies of at-risk children, it may be important to think of the results as highly relevant to children with poor attachment histories, but perhaps not equally relevant to the testing of attachment therapy's postulates about normal development. The same point applies to the increasing numbers of clinical discussions of attachment behavior (e.g., Rutter et al., 2007). As Beauchaine (2009) has noted in a discussion of childhood behavior problems, "Mechanisms of behavior are not always the same at the extremes of a distribution as they are near the mode" (p. 83).

Variability and outcome measures. A difficult research issue involves estimates of the variability of attachment behavior and processes, both within and between individuals. Ongoing questions about measures have been barriers to large-scale studies that might give more information about individual differences, rates and patterns of developmental change, and the establishment of ranges of normal development. Assessment of attachment for research purposes has generally used measures like the Strange Situation Paradigm (Ainsworth et al., 1978) and the Adult Attachment Interview (van Ijzendoorn, 1995). Clinical assessments have focused on the diagnosis of Reactive Attachment Disorder (American Psychiatric Association, 1994). The use of these measures is an important ongoing issue for research testing attachment hypotheses, but the measures themselves are not implicit to attachment theory. Space considerations preclude their discussion in this paper.

Generally accepted tenets of attachment theory

Given the definitional and research issues above, it is evident that assessing support for tenets of attachment theory is not a simple matter. The remainder of this paper considers 11 tenets of Bowlby's attachment theory as they have been discussed and tested in the past as well as more recently. Three of the original tenets of attachment theory appear to have stood unchanged and almost uncriticized. These are (a) that attachment involves an affectional bond, with emotional responses to the presence or absence of specific persons, and thus has motivating effects; (b) that attachment is a robust process and does not require very specific experiences or persons (e.g., the birth mother) to support it; and (c) that during the period from about 6 months to 3 or 4 years, brief and unaccustomed separation from an attachment figure produces protest and distress on the child's part; longer separations trigger a mourning process, following which a new attachment is possible under good circumstances. (Although this third tenet has become an orthodox belief about early development, its first part received early criticism suggesting that Bowlby had overstated his evidence when he asserted that "these are the usual responses of young children to separation from the mother regardless of circumstance. … [A study of 13 young children showed that they] coped with separation from the mother when … the

adverse factors which complicate institutional studies were absent" [Robertson & Robertson, 1971, pp. 312–313].)

Tenets of attachment theory: Accepted, or under construction?

The three tenets just described have received little criticism. The following group of tenets of attachment theory have received varying amounts of criticism, and some have been reworked or reinterpreted, while others appear to be in need of reworking on the basis of new evidence; these tenets may be though of as "under construction."

Tenet 4: Attachment occurs as a result of social interactions between caregiver and child, not of feeding or other physical care, and the quality of caregiving makes a difference to the development of secure attachment

Historical criticisms. This tenet received intense criticism from psychoanalysts because it contradicted the view, then shared by several psychoanalytic schools, that feeding was the essential attachment experience, involving both the pleasure principle and a connection with instinctual processes (Freud, 1960).

Recent criticisms. More recently, general criticisms have challenged the claim that parenting behaviors of any type are the most important cause of child outcomes (Scarr, 1992) and therefore presumably of attachment. The effects of social environments on children have been seen as being far more complicated than simple influences either of social interactions or of feeding: for example, existing characteristics of children may be evocative of parent-initiated social interactions. Using an argument of considerable relevance to this tenet of attachment theory, critics have pointed out the possibility that parents and children resemble each other in personality and behavior because they share the genetic material that determines these phenotypic factors. The role of genetic factors in determining psychological outcomes has been strongly supported (Rutter, 2002).

Related evidence. However, current work on factors determining secure attachment suggests that "there is reason to believe that the quality of infant–caregiver relationships may be one of the rare developmental phenotypes for which small or nonexistent heritability estimates might obtain" (Roisman & Fraley, 2006, p. 1657). Associations between parental behavior and child outcome may thus be causal in non-genetic ways, a conclusion suggesting renewed support for the general idea of parental behavior as a cause of attachment differences.

A relevant study that eliminated genetic factors as well as early interaction history was a meta-analysis examining attachments of children to their day-care providers. In this work, caregivers' sensitivity to individual children was a predictor of attachment security only in small family-day-care settings, but in center-based care, with larger groups, greater child attachment security was associated with caregivers' sensitivity to the group (Ahnert, Pinquart, & Lamb, 2006). As it is likely that children in day-care were fed and

given physical care in similar ways, as required by law, this work suggest that the important factors in attachment have to do with social interactions.

Some recent studies have shown evidence of connections between a mother's attachment status and that of her child, an especially important issue when the focus is on foster care and the possibility of correcting earlier, regrettable social experiences (Dozier, 2003). This work suggests that subtle aspects of caregiving quality are important factors in the development of attachment and that social interactions are more relevant than physical care. However, as social interactions often occur in the context of physical care, it may be difficult to disentangle the two.

Tenet 5: Attachment is based on inborn tendencies to respond to social stimuli, and is thus equivalent to innate mechanisms in other species (described by ethologists); these inborn tendencies exist as a result of natural selection

Historical criticism. Ethological concepts saved attachment theory from reduction either to simple description or to a psychoanalytic battleground by providing a well-developed alternative theoretical framework. However, Bowlby's use of ethology was criticized early as employing an approach already abandoned by ethologists. His conception was described as "based on that part of the instinct theory of ethology which assumes the *fully innate, unlearned character of most complex behavior patterns*" (Schur, 1960, p. 64). Ethologists seriously questioned the practice of generalizing from non-human evidence to create theories of human development, and emphasized the need to choose comparisons from among appropriate animals whose characteristics were generalizable to human beings (Brannigan & Humphries, 1972; Crnic, Reite, & Shucard, 1982).

From an early period in the formulation of attachment theory, some authors completely rejected the ethological approach and proposed that attachment behavior could be explained more parsimoniously as a result of operant conditioning. Reinforcement of attachment behavior by kinesthetic and tactile stimulation was stressed, thus differentiating this approach from the psychoanalytic emphasis on feeding. The possibility that mothers' behavior was reinforced by infant behaviors, as well as the other way around, was an important part of this perspective (Gewirtz, 1961; Gewirtz & Boyd, 1977), which obviously contradicted the nativist view of Bowlby's theory.

Recent criticism. Rutter's (1995) analysis of attachment theory noted that the ethologic aspects of attachment theory had diminished, particularly the original parallels between attachment and imprinting. More recently, theorists working at the intersection of attachment theory and mentalization have argued that an evolutionary function of early object relations is "to equip the very young child with an environment within which the understanding of mental states in others and the self can fully develop. … we can infer that evolution has placed particular value on developing mental structures for interpreting interpersonal actions" (Fonagy, Gergely, Jurist, & Target, 2002, p. 5).

Related evidence. Much modern work on early development has stressed infants' very early demonstration of responsiveness to human faces and voices, such as the imitation

of adult facial expressions as early as 36 hours after birth (Meltzoff & Moore, 1989). By a few months of age, babies become distressed and disorganized when looking at an adult face that shows no response to them, and by 6 months they are increasingly likely to avert their eyes from such a sight (Toda & Fogel, 1993). Whether or not these social responses are innate is not certain, but their early appearance does place them in a position to facilitate the social interactions that are thought to create attachment.

Tenet 6: Attachment processes are limited to a sensitive period lasting from 6 months to 3 or 4 years of age

Historical criticism. Some early responses to the "sensitive period" concept were related to the rejection of ethological perspectives; "critical" or "sensitive" periods are a feature of ethological thought and are related to the work on imprinting that was originally equated with human attachment. Psychoanalytic assumptions were also considered to contradict the argument that attachment occurred during the early part of this age range. Emotional attachment in the form of a relationship with another person was considered to involve ego or reality functions, a type of function then thought not to occur until the end of the first year of life (Hartmann, 1956). The issue for psychoanalysts was not so much the idea of a sensitive period as the possibility of emotional attachment before age 1 year.

Recent criticism. Rutter (1995), in his assessment of attachment theory, suggested that the sensitive period position had softened, and that new social experiences were considered to affect attachment after the toddler and early preschool period. Current views do not suggest that infants under 6 months of age can form selective attachments, although there is no doubt that the early months prepare for attachment (cf. Greenspan, 1992). During that pre-attachment period, infants develop stronger interest in and skills for social interaction, and adult caregivers simultaneously improve their understanding of specific infants' communication.

Related evidence. Recently, there has been increased understanding of continuing developmental plasticity after age 3 or 4, and particularly of the ability of children reared in institutions to benefit from adoption into a family (Rutter, 2002). Various therapeutic efforts to improve children's quality of attachment (cf. Marvin & Whelan, 2003) also assume that attachment involves experience-dependent, rather than the time-limited experience-expectant, plasticity. Zeanah and Smyke (2008) have commented on the possibility that it is so important from an evolutionary point of view for children to form attachments that those who have been deprived of regular caregivers retain the ability to attach when they move to better social environments. However, these authors left open the question of how long such a window of opportunity might last.

Tenet 7: Attachment is essentially monotropic, although more than one caregiver may play the role of attachment figure

Historical criticism. Bowlby's initial adoption of the principle of monotropy, derived from imprinting studies, met with early attempts at redefinition. For example, Hinde (1982)

commented that "Bowlby was referring to relationships … providing 'felt security' to the infant, and never denied the possible importance of relationships of other kinds" (p. 230).

Recent criticism. Rutter (1995) noted that the principle of monotropy had essentially been discarded from attachment theory. Nevertheless, the "day-care wars" of the 1990s had some connection with the idea that a child attaches to a single person, as well as with concerns over whether sufficient social interaction could take place for infants in group care. Most work today assumes that a small number of primary attachments co-exist with secondary and other attachments, organized in a hierarchical fashion (Lamb, 1997).

Related evidence. A "natural experiment" at the end of the Second World War provided information that has never been thoroughly interpreted, despite its potential meaning for attachment theory. This was the observation of the six preschool children rescued from the Theresienstadt concentration camp and cared for at the English Bulldogs Bank orphanage for some years (Freud & Dann, 1951). The Bulldogs Bank children had been separated from their mothers early in the first year and had received a minimum of care but had always been together. At 3 years of age or a little older, these children were strongly attached to each other and to no one else; they exchanged care and solicited care from each other as well as maintaining their proximity. Freud and Dann initially reported the children's normal cognitive development and generally acceptable behavior, but later noted that in adolescence the children were moody and rebellious (Freud, 1960).

Tenet 8: Early attachment experiences play an essential part in determining later social behavior

Historical criticisms. Because this tenet is held in common with psychoanalytic views, Bowlby's psychoanalytic opponents stated no objection to the claim. General criticisms were suggested by Wootton (1962), whose argument was not so much that the idea was wrong, as that Bowlby's evidence was too weak to support it. Discussion of the connection between earlier and later events quickly turned to a conceptual struggle as researchers tried to establish methods for testing this tenet. Expectable developmental changes in social behavior meant that it was impossible to establish the existence of an attachment trait, or stable characteristic, by looking for the same type of behavior at different ages. Measures of attachment behavior that were suitable for use with toddlers were not applicable to older children, adolescents, or adults—a situation similar to that in the contemporaneous study of temperament. Sroufe and Waters (1977) suggested that the point was to consider how behavior was organized around attachment, and to consider behaviors of different types that all had as their goal the achievement of "felt security."

Recent criticisms. Rutter (1995) noted the continuing problem of measures appropriate for different ages. A general criticism has focused on the assumption of infant determinism, the conventional belief that events in early life have a greater causal power than those which occur later (Kagan, 1998). With respect to attachment, the rejection of infant determinism would suggest that later social interactions could have greater impact on later attachment measures than early experience does.

Related evidence. Empirical research reported by Rutter (2002) examined the occurrence of separation of parent and child, the factor considered by Bowlby to be of such power in determination of later development, and concluded that "it is clear that parental loss or separation carries quite mild risks unless the loss leads to impaired parenting or other forms of family maladaptation" (p. 8). However, Rutter et al. (2007) reported an association between indiscriminate friendliness in adolescence and the experience of care deprivation in institutions in earlier life.

Tenet 9: Different as they may appear, attachment behaviors occurring at different ages are all part of the same attachment control system, which has its own motivational and functional organization, and their activation is guided by the nature of that system as well as by environmental events

Historical criticisms. Psychoanalytic thinkers argued for a much more general concept of motivation as determined by the pleasure principle (Freud, 1960), and opposed the idea of separate motivational systems for attachment and other functions.

Recent criticism. Rutter (1995) noted that

> substantial uncertainty remains on the sort of control system to be envisaged (should this be in neurobiological terms or in cognitive functioning?) and there is continuing uncertainty as to quite how the hypothesized system might actually work. It seems likely that the mechanisms involved in determining that proximity-seeking takes place how and when it does may well not be the same as the mechanisms involved in determining the *qualities* of a selective attachment relationship. (p. 552)

Sroufe and Waters (1977), in their extensive analysis of attachment theory, commented that "attachment refers to an affective tie between infant and caregiver and to a behavioral system, flexibly operating in terms of set goals, mediated by feeling, and in interaction with other behavioral systems" (p. 1185). Other systems mentioned later in the paper were exploration, affiliation, and wariness.

Related evidence. Some tentative steps have been taken to integrate into attachment thinking the concepts inherent in dynamic systems theory (as opposed to the concept of control systems employed by Bowlby), although it has been pointed out that there is a peculiar affinity between dynamic systems thinking and the study of development (Aslin, 1993).

Dynamic systems theory has the advantage of handling caregiver behavior and other contextual factors as well as the child's attachment characteristics. Thus,

> if the attachment behavior exhibited by the child becomes more insecure, this could subsequently elicit more concerted effort on the part of the parent to help restore the child's feelings of security. … The successive reorganization of attachment behavior resulting in enhanced sophistication or developmental change is inherently dependent on environmental input, rendering the role of the environment in the acquisition of attachment behavior critically important … [and] actively constructed. (Coleman & Watson, 2000, p. 304)

Examination of the attachment system from a dynamic-system perspective may result in different conclusions about control systems than have been the case in the past.

Tenet 10: Attachment involves mental representations of social relationships; these representations develop into an internal working model relevant to later social behavior

Historical criticism. Initially, criticism of this cognitive aspect of attachment theory was limited to psychoanalytic thinkers (e.g., Hartmann, 1956), who assumed that cognition, like other ego functions, was undeveloped during the first year of life, the period when most important attachment processes occur, and therefore could not contribute to the first steps of attachment. There was little or no discussion of the cognition–attachment connection as such.

Fraiberg (1969) attempted to relate some psychoanalytic views of attachment to Piaget's theory of cognitive development, a framework that involved considerable speculation about infant cognitive abilities. Fraiberg compared the term "object constancy" (a later psychoanalytic usage referring to a stable mental representation of a beloved person) to the Piagetian "object concept," a set of schemas including the idea that an object or person continues to exist when not present or not visible ("object permanence"). Fraiberg's analysis of this issue recognized problems resulting from the Piagetian approach. Piaget's theory suggested that evocative memory develops at about 18 months; however, separation anxiety, a behavior implying memory of the attachment figure, begins 10 or more months earlier. Fraiberg's solution to this problem was to suggest that separation anxiety depends on a simpler form of memory, recognition memory, and does not require the advances of the later sensorimotor period. Fraiberg did not comment on Piaget's report that "object permanence," as displayed in "peek-a-boo" or the simplest achievements in finding hidden objects, begins at about the same time as separation anxiety, toward the end of the first year.

Sroufe and Waters (1977), in their extensive analysis of attachment theory, focused on behavioral systems such as those involved in exploration, affiliation, and wariness. No discussion of mental representations was pursued.

Recent criticism. As Rutter (1995) later noted, "most developmentalists have come to see cognitive processes as the key mediating mechanism" for attachment (p. 1257). However, at the present time, such a perspective can only be considered to be partially adopted. Attempts to measure attachment characteristics by means of structured interviews and narrative tasks clearly make use of cognitive processes, but focus on those processes in place in later childhood and adulthood. How early attachment processes are mediated through cognition is rarely addressed.

Related evidence about infant development. Little of the brilliant modern work on infant cognitive development has been integrated into the understanding of attachment, although many aspects of this work are relevant to the infant's growing abilities to think about the self and about other human beings. For example, very early and relevant abilities have been shown in demonstrations of early imitation of facial expressions

(Meltzoff & Moore, 1989), and of interest well before 12 months in mirror images and looking back and forth from a person to his or her image (Butterworth, 1990). These behaviors help to establish concepts of the self and the other that are essential to attachment and other social attitudes. Findings about later imitation (Bauer & Dow, 1994; Bauer & Mandler, 1992) suggest a possible very early beginning for aspects of the internal working model of social relationships, and imply the need to regard attachment in the first year as a matter of thoughts and expectations as well as emotion.

Much modern work has shown that infants represent and understand the world in sophisticated ways, demonstrable not through direct performance (i.e., in connection with procedural memory), but through violation-of-expectation methods (Baillargeon, 1994; Wynn, 1992). These methods record the infant's expression of surprise at unexpected events and suggest rapid early development of cognitive capacities more complex than procedural memory and relevant to the internal working model of attachment. Early recognition memory is also relevant to the formation of an internal working model. The development of this type of memory can be shown through a technique that allows 2- to 6-month-olds to learn that kicking causes a mobile of a certain appearance to move. Significantly, the youngest babies learn this more slowly and forget it more quickly than older babies, but all remember longer when they are simply allowed to look at the mobile on the day before they are tested (Rovee-Collier & Boller, 1995). These findings suggest that events may have a stronger effect on memory when they occur in an environmental context that is experienced repeatedly, a point relevant to attachment theory.

Related evidence from later cognitive development. The role of cognition in mediating attachment after infancy has been considered with more apparent success than has infant cognition. The development of a *script*, a complex and long-lasting cognitive structure, has been of particular interest (H.S. Waters & Waters, 2006).

Evidence about the development of Theory of Mind, or mentalization, has been partially integrated into attachment theory (Fonagy et al., 2002). The development of the internal working model can logically be assumed to be affected by this growing cognitive ability to predict and understand the actions of others. A realistic grasp of social relationships requires the skill to take into account other people's desires, intentions, and knowledge. For example, to maintain a secure attachment, a toddler needs to understand that his mother may sometimes unintentionally or for other reasons fail to respond in a way that facilitates felt security, and that a nurturing attitude toward a child may be completely congruent with occasional errors or even deliberate withholding of response. Before age 4 or 5, children do not generally understand that an adult's actions can stem from lack of information or from false beliefs (Flavell, 2007), but instead assume that the adult is aware of the child's reality and intentionally ignores it at times. The further development of Theory of Mind in the later preschool years is especially significant for the internal working model as it applies to negotiation and compromise, abilities that require understanding of a partner's bargaining position. Some authors have given serious and effective attention to the connections between attachment experiences and the development of reflective function (Fonagy et al., 2002). However, there has been relatively little discussion of this mentalizing function as a part of goal-corrected partnership (Bowlby, 1982).

The child psychiatrist Stanley Greenspan has proposed a series of steps of combined emotional and cognitive development occurring between birth and age 5 years (Greenspan, 1992) but little or no systematic research has been presented to support this stage theory.

Tenet 11: Separation, loss, and other undesirable social experiences, such as a succession of caregivers in early life, may produce pathological outcomes, for example delinquency or emotional disturbance

Historical criticism. Rejection of this tenet began before attachment theory's final formulation by Bowlby, and occurred in response to his 1951 report about the consequences of maternal deprivation. Wootton (1962) commented with concern on the fact that "[i]nstitutionalized children are not a random sample of the population of their age" (p. 259). In addition, she pointed out that some individuals have poor early attachment experiences but no serious later pathology, and others develop delinquent or disturbed behavior despite what appears to be good experiences with caregivers in early life.

Recent criticism. Current thinking about attachment theory appears to stress this tenet, with particular interest in pathological outcomes from poor early experiences. Several categories of non-secure attachment have been created, and extensive work has investigated their predictive value for later pathology (see Fonagy et al., 2002). This type of work has generally concluded that less-than-ideal early attachment status is correlated with later emotional problems. However, the extent to which the relationship is causal is obviously unclear, as the social setting that helped produce a poor attachment status may continue to work to encourage delinquency or mental illness.

Related evidence. Current work on issues like resilience (Kaufman, 2008) and temperament (Laible, Panfile, & Makariev, 2008) shows the potential impact of individual differences on attachment-related outcomes; the work of Rutter (2002), noted earlier, has stressed the interaction of multiple risk factors in the creation of pathology.

The study of pathological outcomes has a particular importance for the testing of attachment theory. In most aspects of attachment research, ethical and practical considerations make it impossible to test the effects of independent variables by the use of randomized controlled trials. Thus comparisons between groups who have had different early experiences are always affected by possible confounded variables, and the causes of outcomes are not clear. However, interventions can and should be tested with randomized designs, and the results of such studies may provide confirmation or disconfirmation of aspects of attachment theory.

An alternative view of Tenet 11. A revised view of this tenet has been presented in the form of a "modern attachment theory" (A.N. Schore, 2000; J.R. Schore & A.N. Schore, 2008). A.N. Schore referred to this proposed update as "regulation theory." He has focused on the development of "a pragmatic framework for models of both psychopathogenesis and the change process in psychotherapy" (J.R. Schore & A.N. Schore, 2008, p. 10).

The proposed framework suggests that "attachment communications are critical to the development of structural right brain neurobiological systems involved in processing of emotion, modulation of stress, self-regulation, and therefore the functional origins of the bodily-based implicit self" (p. 10).

Schore's regulation theory has two major components: (a) the tenet that attachment and its regulatory functions are based on, and also shape, important aspects of the right hemisphere of the brain; and (b) the tenet that early caregiver–child interactions such as mutual gaze episodes create the experience of shared affect and thus dyadic regulation of emotion. Schore has proposed that the

> regulatory processes of affect synchrony that create states of positive arousal and … modulate states of negative arousal are the fundamental building blocks of attachment and its associated emotions, and resilience in the face of stress and novelty is an ultimate indicator of attachment security. (J.R. Schore & A.N. Schore, 2008, p. 11)

Neuroscientific claims. The "Decade of the Brain" has brought into high fashion the use of neurological explanations for psychological phenomena. The fact that these are sometimes inadequately supported by evidence has been reflected in such statements as the Santiago Declaration (Santiago Declaration, 2007), which includes the opinions of noted early interventionists and argues that our present knowledge of neurological development is not adequate support for claims of causal connections between brain mechanisms and emotional or cognitive events. Certainly, evidence from direct measurement of developmental change in young human brains is sparse, even in the era of imaging techniques. As Zeanah and Smyke (2008) have specifically pointed out, "Little … is understood about the neural substrate underlying attachment processes" (p. 230).

Earlier in this paper, I argued against generalization of data about attachment from one species to another. What about information from pathology? Can this be generalized to support a view of normal early development? In this case, a positive answer would depend on the extent to which early development and later pathological events actually resemble each other. This resemblance determines whether the analogy is a true or a false one.

With respect to these issues, A.N. Schore's speculation about right-brain functioning is on shaky evidentiary ground. Passing over the well-known fact of the holistic functioning of an intact brain, we can note that a careful parsing of Schore's sources (J.R. Schore & A.N. Schore, 2008) suggests a lack of due attention to some important points. In addition to a number of references to Schore's own publications as evidence for specialized attachment-related right-hemisphere functioning, Schore and Schore cited about 10 sources as indicating empirical evidence for the postulated connection. Of these, two (Ovtscharoff & Braun, 2001; Sullivan & Gratton, 2002) involved work on rodents, which was presented as supportive evidence without any textual reference to the use of data from non-humans. One paper (Prodan, Orbelo, Testa, & Ross, 2001) described hemispheric differences in processing upper and lower parts of a facial display, and concluded that lower facial displays are preferentially processed by the left hemisphere and upper facial displays by the right hemisphere; Schore and Schore mentioned only the right-hemisphere data. A fourth paper (Le Grand, Mondloch, Maurer, & Brent, 2003) discussed

facial processing deficits in persons for whom a cataract in early infancy had prevented stimulation of the right visual cortex; Schore and Schore cited this paper as evidence for the right-brain hypothesis without noting that the teratogenic or genetic event that triggered the cataract might also have caused atypical brain development, thus confounding environmental and biological factors.

Much of the evidence Schore has presented in support of his view of the role of the right brain in attachment can thus be regarded as only weakly relevant. However, such a conclusion does not amount to rejection of the entire "modern attachment theory," as the remainder of the theory can operate independently of a specific brain mechanism.

Regulation theory. Schore's "modern attachment theory" focuses on important events of the first months of life, especially experiences based on the caregiver's abilities to regulate the infant's state of arousal. Feeding, comforting, and engagement or disengagement from play are all potential means of regulation, but they function appropriately only if the caregiver correctly reads the infant's cues, or repairs communicative errors effectively. Schore (J.R. Schore & A.N. Schore, 2008) proposed that the dyadic communication and regulation shown by infant and mother are paralleled by those of the patient–therapist dyad, and that the attitudes developed during early dyadic experiences are part of the self and re-emerge in therapy. In Schore's view, "the attachment between therapist and client is established over time, allowing for the expression of experiences that resonate with the original infant–mother intersubjective history of the first two years" (J.R. Schore & A.N. Schore, 2008, p. 16).

Schore's discussion of dyadic and self-regulation as the essential aspect of attachment is well grounded in research on early infant–mother interactions among humans and thus fills a gap in Bowlby's attachment theory, which does little to describe the events that precede the emergence of clear-cut attachment behavior relatively late in the first year. Schore's theory can be used to explain safe haven and secure base behaviors as efforts to maintain emotional regulation in the face of experienced threats or of a conflict between exploratory and security motivation. However, Schore's regulation theory does little to explain important points of development that are both easily observable and discussed by Bowlby. For example, how does regulation theory deal with the rather abrupt re-organization of responses to strangers normally seen toward the end of the first year? Schore has referred to the development of relational systems as experience-dependent (J.R. Schore & A.N. Schore, 2008), but abrupt re-organizations would be more probable in experience-expectant plasticity (Greenough, Black, & Wallace, 1987); indeed, Cicchetti (1991) referred to the idea that "certain types of 'experience expectant' inputs by caregivers are critical … for the full maturation of neuroregulatory systems" (p. 273). How does regulation theory deal with developmental changes that form an important part of attachment theory, such as preschoolers' negotiation of separation and older children's goal-corrected partnerships with others? These steps between early infancy and adult attachment status appear to be neglected by regulation theory.

Conclusion

The first three tenets of attachment theory (the affectional bond, the robustness of attachment, and the association between separation, protest, and grief) have received little

criticism, historically or more recently. Of the other explicit tenets, one group has received more support than criticism, and may be classed as at least partially supported. In this group are Tenet 4 (effect of quality of care), Tenet 8 (continuity from early to later development), and Tenet 10 (the internal working model). All of these tenets are subject to difficulties inherent in measurement and categorization, as well as the need to incorporate related research findings.

A third group has received more criticism than support and may be classed as partially rejected. This group includes Tenet 5 (ethology, evolutionary background), the details of which have been the subject of argument; this tenet has been of little use in predicting aspects of attachment, however good a *post hoc* explanation it may provide. Efforts to support Tenet 11 (pathological outcomes) are challenged by difficulties of diagnosis and by the problem of disambiguating attachment history and other social experiences or child characteristics. Other difficulties for Tenet 11 stem from the ethical and practical problems of empirical research on this topic.

A fourth group of tenets have been either rejected or reinterpreted. Tenet 6 (critical period) has been weakened to a level that does little more than stress early experience as a factor in emotional development. Tenet 7 (monotropy) has long since been reworked into a statement about hierarchies of selective preference. Tenet 9 (systems) appears to be in abeyance as theorists consider the relevance of dynamic systems theory to attachment as well as to other aspects of early development; the idea of systems at work is not rejected, but the complexity of the systems' rules needs rethinking. These tenets must at this point receive the Scotch verdict, "not proven."

Nonetheless, Bowlby's attachment theory, one of the last of the "grand theories," has not been replaced or extensively reworked. The focus of attachment-related work has shifted, however, and the most active area currently is connected with psychopathology and clinical work. The fortuitous development of access to the Romanian orphan population in the 1990s may have been a major cause of this shift. Popular concerns with attachment, meanwhile, such as those reflected in judicial use of the "best interest of the child" concept (Goldstein, Solnit, Goldstein, & Freud, 1996) and in the views described by Nilsen (2003), have raised further questions about attachment and psychopathology.

Meanwhile, although there have been productive longitudinal studies focused on attachment issues, there has been little empirical work directly concerned with normal events in the development of attachment relationships. Such work would require meticulous observation and would demand intensive labor, if it were done with the microgenetic approach suggested by Werner (1948) many years ago, but it would provide important insights into the effects of attachment history stated in Tenet 5. While still demanding, such work would be facilitated by the use of software such as the GridWare program (Lamey, Hollenstein, Lewis, & Granic, 2004), now being used for studying children's peer relationships. This approach might also yield information about the relational disorders of early childhood suggested by the DC:0–3R diagnostic system (Zero to Three, 2005).

Attempts to test Tenet 8, which states that development of attachment is continuous through life, have always been challenged by developmental changes in attachment-related behavior. Most such work has been concerned with associations between toddler attachment status and later adult characteristics. Relatively little work has looked carefully at the intermediate steps in attachment suggested by Bowlby, particularly negotiation

of separation and the growth of goal-corrected partnerships. An increasing research interest in autonomy may signal a turn toward work on these developmental steps (e.g., Crockenberg, 1992; Ryan, Deci, Grolnick, & La Guardia, 2006; Van Ryzin, Gravely, & Roseth, 2009).

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References

Ahnert, L., Pinquart, M., & Lamb, M.E. (2006). Security of children's relationships with nonparental care provider: A meta-analysis. *Child Development*, *77*, 664–679.

Ainsworth, M., Blehar, M., Waters, E., & Wall, S. (1978). *Patterns of attachment.* Hillsdale, NJ: Erlbaum.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed). Washington, DC: Author.

Aslin, R. (1993). Commentary: The strange attractiveness of dynamic systems to development. In L. Smith & E. Thelen (Eds.), *A dynamic systems approach to development: Applications* (pp. 385–399). Cambridge, MA: MIT Press.

Baillargeon, R. (1994). How do infants learn about the physical world? *Current Directions in Psychological Science*, *3*(5), 133–140.

Bauer, P., & Dow, G. (1994). Episodic memory in 16- and 20-month-old children: Specifics are generalized but not forgotten. *Developmental Psychology*, *30*, 403–417.

Bauer, P., & Mandler, J. (1992). Putting the horse before the cart: The use of temporal order in recall of events by one-year-old children. *Developmental Psychology*, *28*, 441–452.

Beauchaine, T.P. (2009). Some difficulties in interpreting psychophysiological research with children. In M. El-Sheikh, C.D. Kouros, S. Rath, E.M. Cummings, P. Keller, & L. Staton (Eds.), Marital conflict and children's externalizing behavior: Interactions between parasympathetic and sympathetic nervous system activity. *Monographs of the Society for Research in Child Development*, *74*(1, Serial No. 292), 80–88.

Becket, C., Maughan, B., Rutter, M., Castle, J., Colvert, E., Groothues, C., ... Sonuga-Barke, E.J.S. (2007). Early adolescent outcomes for institutionally-deprived and non-deprived adoptees: I. Disinhibited attachment. *Journal of Child Psychology and Psychiatry*, *48*, 17–30.

Bowlby, J. (1958). The nature of the child's tie to his mother. *International Journal of Psychoanalysis*, *39*, 350–373.

Bowlby, J. (1960). Grief and mourning in infancy and early childhood. *Psychoanalytic Study of the Child*, *15*, 9–52.

Bowlby, J. (1982). *Attachment.* New York, NY: Basic Books.

Brannigan, C.R., & Humphries, D.A. (1972). Human non-verbal behavior: A means of communication. In N.B. Jones (Ed.), *Ethological studies of child behaviour* (pp. 37–64). Cambridge, UK: Cambridge University Press.

Butterworth, G. (1990). Self-perception in infancy. In D. Cicchetti & M. Beeghley (Eds.), *The self in transition* (pp. 119–138). Chicago, IL: University of Chicago Press.

Cicchetti, D. (1991). Fractures in the crystal: Developmental psychopathology and the emergence of self. *Developmental Review*, *11*, 271–287.

Coleman, P., & Watson, A. (2000). Infant attachment as a dynamic system. *Human Development*, *43*, 295–313.

Crnic, L.S., Reite, M.L., & Shucard, D.W. (1982). Animal models of human behavior: Their application to the study of attachment. In R.N. Emde & R.J. Harmon (Eds.), *The development of attachment and affiliation* (pp. 31–42). New York, NY: Plenum.

Crockenberg, S. (1992). How children learn to resolve conflict in families. *Zero to Three*, *12*(4), 11–13.

Dozier, M. (2003). Attachment-based treatment for vulnerable children. *Attachment & Human Development*, *5*, 253–257.

Emery, A.M.P., & von Bayern, N.J. (2009). Jackdaws respond to human attentional states and communicative cues in different contexts. *Current Biology, 19*, 602–606.

Flavell, J.H. (2007). Theory-of-Mind development: Retrospect and prospect. In G.W. Ladd (Ed.), *Appraising the human developmental sciences* (pp. 38–55). Detroit, MI: Wayne State University Press.

Fonagy, P., Gergely, G., Jurist, E.L., & Target, M. (2002). *Affect regulation, mentalization, and the development of the self.* New York, NY: Other Press.

Fraiberg, S. (1969). Libidinal object constancy and mental representation. *Psychoanalytic Study of the Child*, *24,* 9–47.

Freud, A. (1960). Discussion of Dr. John Bowlby's paper. *Psychoanalytic Study of the Child*, *15*, 53–62.

Freud, A., & Dann, S. (1951). An experiment in group upbringing. *Psychoanalytic Study of the Child*, *6*, 127–168.

Gewirtz, J.L. (1961). A learning analysis of the effects of normal stimulation, privation and deprivation on the acquisition of social motivation and attachment. In B. Foss (Ed.), *Determinants of infant behavior* (pp. 213–299). London, UK: Methuen.

Gewirtz, J.L., & Boyd, E.F. (1977). Experiments on mother–infant interaction underlying mutual attachment acquisition: The infant conditions the mother. In T. Alloway, P. Pliner, & L. Krames (Eds.), *Advances in the study of communication and affect: Vol. 3. Attachment behavior* (pp. 109–143). New York, NY: Plenum.

Goldstein, J., Solnit, A., Goldstein, S., & Freud, A. (1996). *The best interest of the child: The least detrimental alternative.* New York, NY: Free Press.

Greenough, W., Black, J., & Wallace, C. (1987). Experience and brain development. *Child Development*, *58*, 535–559.

Greenspan, S.I. (1992). *Infancy and early childhood.* Madison, CT: International Universities Press.

Hartmann, H. (1956). Notes on the reality principle. *Psychoanalytic Study of the Child*, *11*, 31–53.

Hinde, R.A. (1982). *Ethology.* Oxford, UK: Oxford University Press.

Hofer, M.A. (2006). Psychobiological roots of early attachment. *Current Directions in Psychological Science*, *15*(2), 84–88.

Kagan, J. (1998). *Three seductive ideas.* Cambridge, MA: Harvard University Press.

Kaufman, J. (2008). Genetic and environmental modifiers of risk and resiliency in maltreated children. In J.J. Hudziak (Ed.), *Developmental psychopathology and wellness: Genetic and environmental influences* (pp.141–160). Arlington, VA: American Psychiatric Publishing.

Laible, D., Panfile, T., & Makariev, D. (2008). The quality and frequency of mother–toddler conflict: Links with attachment and temperament. *Child Development*, *79*, 426–443.

Lamb, M.E. (1997). The development of father–infant relationships. In M.E. Lamb (Ed.) *The role of the father in child development* (pp. 104–120). Hoboken, NJ: Wiley.

Lamey, A., Hollenstein, T., Lewis, M.D., & Granic, I. (2004). GridWare (Version 1.1 Beta) [Computer software]. Available: http://statespacegrids.org

Le Grand, R., Mondloch, C., Maurer, D., & Brent, H. P. (2003). Expert face processing requires visual input to the right hemisphere during infancy. *Nature Neuroscience*, *6*, 1108–1112.

Marvin, R.S., & Whelan, W.F. (2003). Disordered attachment: Toward evidence-based clinical practice. *Attachment & Human Development*, *5*, 283–288.

Meltzoff, A.N., & Moore, M.K. (1989). Imitation in newborn infants: Exploring the range of gestures imitated and the underlying mechanisms. *Developmental Psychology*, *25,* 954–962.

Nilsen, W.J. (2003). Perceptions of attachment in academia and the child welfare system: The gap between research and reality. *Attachment & Human Development*, *5*, 303–306.

Ovtscharoff, W., Jr., & Braun, K. (2001). Maternal separation and social isolation modulate the postnatal development of synaptic composition in the infralimbic cortex of *octodon degus. Neuroscience*, *104*, 33–40.

Prodan, C.I., Orbelo, D.M., Testa, J.A., & Ross, E.D. (2001). Hemispheric differences in recognizing upper and lower facial displays of emotion. *Neuropsychiatry, Neuropsychology and Behavioral Neurology*, *14*, 206–212.

Rheingold, H. (1963). *Maternal behavior in mammals.* Oxford, UK: Wiley.

Robertson, J., & Robertson, J. (1971). Young children in brief separation: A fresh look. *Psychoanalytic Study of the Child*, *26*, 264–313.

Roisman, G.I., & Fraley, R.C. (2006). The limits of genetic influence: A behavior-genetic analysis of infant–caregiver relationship quality and temperament. *Child Development*, *77*, 1656–1667.

Rovee-Collier, C., & Boller, K. (1995). Current theory and research on infant learning and memory: Application to early intervention. *Infants and Young Children*, *7*, 1–12.

Rutter, M. (1995). Clinical implications of attachment concepts: Retrospect and prospect. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *36*, 549–571.

Rutter, M. (2002). Nature, nurture, and development: From evangelism through science toward policy and practice. *Child Development*, *73*, 1–21.

Rutter, M., Colvert, E., Kreppner, J., Beckett, C., Castle, J., Groothues, C., ... Sonuga-Barke, E.J.S. (2007). Early adolescent outcomes for institutionally-deprived and non-deprived adoptees: I. Disinhibited attachment. *Journal of Child Psychology and Psychiatry*, *48*, 17–30.

Ryan, R.M., Deci, E.L., Grolnick, W.S., & La Guardia, J.G. (2006). The significance of autonomy and autonomy support in psychological development of psychopathology. In D. Cicchetti & D.J. Cohen (Eds.), *Developmental psychopathology: Vol. 1. Theory and method* (2nd ed., pp. 795–849). Hoboken, NJ: Wiley.

Santiago Declaration (2007). Retrieved from http://www.santiagodeclaration.org

Scarr, S. (1992). Developmental theories for the 1990s: Development and individual differences. *Child Development*, *63*, 1–19.

Schore, A.N. (2000). Attachment and the regulation of the right brain. *Attachment & Human Development*, *2*, 23–47.

Schore, J.R., & Schore, A.N. (2008). Modern attachment theory: The central role of affect regulation in development and treatment. *Clinical Social Work Journal*, *36*, 9–20.

Schur, M. (1960). Discussion of Dr. John Bowlby's paper. *Psychoanalytic Study of the Child*, *15*, 63–84.

Scott, J.P. (1960). Comparative social psychology. In R.H. Waters, D.A. Rethlingschafer, & W.E. Caldwell (Eds.), *Principles of comparative psychology* (pp. 250–288). New York, NY: McGraw-Hill.

Soares, I., Lemos, M.S., & Almeida, C. (2005). Attachment and motivational strategies in adolescence: Exploring links. *Adolescence*, *40*, 129–154.

Sroufe, L.A. (1979). The coherence of individual development. *American Psychologist*, *34*, 834–841.

Sroufe, L.A. (1996). *Emotional development: The organization of emotional life in the early years.* New York, NY: Cambridge University Press.

Sroufe, L.A. (2005). Attachment and development: A prospective, longitudinal study from birth to adulthood. *Attachment & Human Development*, *7*, 349–367.

Sroufe, L.A., Egeland, B., Carlson, E., & Collins, W.A. (2005). *The development of the person: The Minnesota study of risk and adaptation from birth to adulthood.* New York, NY: Guilford.

Sroufe, L.A., & Waters, E. (1977). Attachment as an organizational construct. *Child Development*, *48*, 1184–1189.

Sullivan, R.M., & Gratton, A. (2002). Prefrontal cortical regulation of hypothalamic-pituitary-adrenal function in the rat and implications for psychopathology: Side matters. *Psychoneuroendocrinology*, *27*, 99–114.

Thompson, R.A. (2005). Multiple relationships multiply considered. *Human Development*, *48*, 102–107.

Toda, S., & Fogel, A. (1993). Infant response to the still-face situation at 3 and 6 months. *Developmental Psychology*, *29*, 532–538.

Trause, M.A., Klaus, M.H., & Kennell, J.H. (1982). Maternal behavior in mammals. In M.H. Klaus & J.H. Kennell (Eds.), *Parent–infant bonding* (2nd ed., pp. 130–150). St. Louis, MO: C.V. Mosby.

van Ijzendoorn, M. (1995). Adult attachment representations, parental responsiveness, and infant attachment: A meta-analysis on the predictive validity of the Adult Attachment Interview. *Psychological Bulletin*, *117*, 387–403.

Van Ryzin, M.J., Gravely, A.A., & Roseth, C.J. (2009). Autonomy, belongingness, and engagement in school as contributors to adolescent psychological well-being. *Journal of Youth and Adolescence*, *38*, 1–12.

Waters, E., & Cummings, E.M. (2000). A secure base from which to explore close relationships. *Child Development*, *71*, 164–172.

Waters, H.S., & Waters, E. (2006). The attachment working models concept: Among other things, we build script-like representations of secure base experiences. *Attachment & Human Development*, *8*, 185–197.

Werner, H. (1948). *Comparative psychology of mental development.* New York, NY: Science Editions.

Wynn, K. (1992, August 27). Addition and subtraction by human infants. *Nature*, *358*, 749–750.

Wootton, B. (1962). A social scientist's approach to maternal deprivation. In World Health Organization (Eds.), *Deprivation of maternal care* (pp. 255–265). New York, NY: Schocken Books.

Zeanah, C.H., & Smyke, A.T. (2008). Attachment disorders in family and social context. *Infant Mental Health Journal*, *29*, 219–233.

Zero to Three. (2005). *Diagnostic classification of mental health and developmental disorders* (Rev. ed.). Washington, DC: Zero to Three.

Jean Mercer is Professor Emerita of Psychology at Richard Stockton College, Pomona, New Jersey. Her interest in attachment theory emerged from exploration of popular beliefs about attachment. She recently published *Child Development: Myths and Misunderstandings* (SAGE, 2009). Address: 134 E. Main St., Moorestown, NJ 08057, USA. [email: jean.mercer@stockton.edu]