ATTACHMENT AND DEVELOPMENTAL PSYCHOPATHOLOGY

R.M. Pasco Fearon, PhD

University College London

Ashley M. Groh

Marian J. Bakermans-Kranenburg

University of Leiden

Marinus H. van IJzendoorn, Ph.D.

University of Leiden

Glenn I. Roisman

University of Minnesota

Acknowledgments

This work was supported in part by a postdoctoral fellowship provided by the National Institute of Child Health and Human Development (T32-HD07376) through the Center for Developmental Science, University of North Carolina at Chapel Hill, to Ashley M. Groh. Marian Bakermans-Kranenburg and Marinus van IJzendoorn were supported by research awards from the Netherlands Organization for Scientific Research (MHvIJ: SPINOZA prize; MJBK: VICI grant no. 453-09-003), and by the Gravitation program of the Dutch Ministry of Education, Culture, and Science and the Netherlands Organization for Scientific Research (NWO grant number 024.001.003).

Contents

Abstract

This chapter examines the conceptual and empirical contributions of attachment theory to the field of developmental psychopathology. It reviews the major elements and methods of attachment theory and research, and considers current evidence regarding a) the environmental and genetic determinants of attachment, b) short-and long-term continuity in attachment processes, c) the association between attachment and emerging psychopathology, d) candidate mediating mechanisms conveying risk, and d) the efficacy of attachment-focused interventions. We end with a consideration of the broader relevance of attachment theory for understanding the process and mechanisms of change in psychological therapies. We conclude that attachment represents a coherent and generally well-supported developmental construct, which is of great potential value as a framework for prevention and intervention. We also highlight several key outstanding issues and qualifications regarding the measurement of attachment, the scope and limits of its effects on children's outcomes, and unresolved scientific issues regarding causal mechanisms.

Keywords: Attachment, parental sensitivity, psychopathology, intervention

Overview

Attachment theory is arguably one of the most important theoretical frameworks for understanding normal and abnormal development to have emerged in the field developmental psychology in the last 60 years. By characterizing the interconnections and mechanisms that mediate between early experiences in primary attachment relationships and long-term emotional adjustment across the lifespan, attachment theory typifies, and indeed has made major contributions to, the developmental psychopathology approach (Cicchetti & Cohen, 1995; Rutter & Sroufe, 2000). The field of attachment, although not without a host of outstanding questions, conundrums and fruitful seams of new research, could reasonably be described as a mature discipline, having tested, confirmed or clarified many of its major theoretical assertions. The theory remains a highly influential and important way of understanding the nature of a child's tie to primary caregivers, which coherently integrates data and theory from social-developmental psychology, cognitive psychology, lifespan developmental psychology, evolutionary psychology and ethology. Its relevance for understanding emotional and behavioral maladjustment, and its value as a framework for intervention and prevention, seems undeniable.

In this chapter, our goal is to provide a comprehensive overview of attachment theory and research from its earliest origins to the very latest research findings, focusing on topics of most direct relevance for understanding the development of psychopathology. We begin with an overview of the historical beginnings of attachment theory and then outline the fundamental tenets of the theory. Next, we

review the empirical literature on the developmental antecedents and consequences of attachment security and insecurity, exploring what is known about mediating mechanisms in the evolution of maladjustment. Next, we turn to work on adolescent and adult attachment. We conclude the chapter with a review of the current state of the art regarding attachment-based interventions and discuss directions for future research.

Historical Overview of Attachment Theory

With its primary focus on the nature of the child's tie to caregivers and the significance of these relationships for developmental adaptation across the life course, attachment theory builds on a long intellectual tradition. Indeed, questions concerning the legacy of early interpersonal experiences with primary caregivers predate the origins of formal developmental science and have their roots in the work of Sigmund Freud. Nevertheless, it is widely acknowledged that when John Bowlby began his thinking on the subject of attachment he was beginning a process, involving an intellectually rich and eclectic group of scientists and clinicians, that would lead to the development of a more or less revolutionary theory, radically different to those of the past. Fundamental to this sea-change in thinking was his use of evolutionary theory as the basis for his theoretical approach, which was greatly inspired by Harlow's work on the Nature of Love, separating attachment from food and sex (see van der Horst & van der Veer, 2010).

Bowlby was particularly influenced by his experiences as a teacher caring for young children before World War II, which were to have a profound impact on him and his thinking (Bretherton, 1992; van Dijken, 1998). He was to work with children whose remote, or anxious and dependent personalities Bowlby viewed as having been

caused by highly disturbed early primary relationships (Bretherton, 1992). He followed-up this line of thinking in detailed case studies of 44 delinquent boys, of whom more than half had experienced significant periods of maternal separation during the first five years of life (Bowlby, 1944). After the war, at a time when displacement, loss and separation were major preoccupations for all concerned with the welfare of children, Bowlby established a research unit dedicated to understanding the effects of separation on children's development. During this period, James Robertson, a psychiatric social worker, had joined Bowlby's team, bringing with him a keen interest in naturalistic observation—a method that, as a consequence particularly of Mary Ainsworth's later work, was to become fundamental to contemporary attachment research. Through extensive observational work, Bowlby and Robertson began to document children's profound response to separation from the mother, which began with protest, followed by despair, and then finally detachment (Bowlby, Robertson, & Rosenbluth, 1952). Such clinical observations raised important questions concerning why children respond so dramatically and predictably to separation from their mothers and what accounted for the intense affective tie between the child and mother. In addressing such questions, Bowlby viewed as inadequate Freud's (e.g., Freud, 1938) drive reduction account of the parent-child relationship in which it was argued that the infant's affective tie to the mother is the secondary result of the mother satisfying the infant's more primary drive for nourishment.

To a significant extent a consequence of this work, in 1949 Bowlby was commissioned by the World Health Organization (WHO) to write a report on the mental health of homeless children. In the course of his research for this report, he immersed himself in what was then known, scientifically and clinically, about

separation, foster care, and child psychiatry more broadly, and consulted widely with colleagues in Europe and the United States. He found striking parallels between his own research and observations and those of others in Europe, notably that of his Dutch colleagues Tibout and De Leeuw (see van Dijken, 1998). Regarding the findings of their work, he stated:

"frequent changes in foster home almost always had very adverse effects, leading the child to become withdrawn and apathetic. This was sometimes accompanied by a superficial sociability and, later, promiscuity. Some young children managed to weather a single change, but others could not stand even this and developed symptoms such as anxiety, depression, excessive clinging, and bedwetting." (van Dijken, 1998).

The report, once completed, sold 400,000 copies and was translated into 16 different languages, and famously concluded that for optimal development "the infant and young child should experience a warm, intimate, and continuous relationship with his mother figure (or permanent mother substitute) in which both find satisfaction and enjoyment" (Bowlby, 1951, p.13). In his writing around this time, the first clear evidence also appears that Bowlby had begun to consider the evolutionary origins of attachment very seriously. He was strongly influenced by the earlier work of Konrad Lorenz on imprinting in birds, and by Harry Harlow's work on rearing in rhesus monkeys (Harlow & Zimmermann, 1959). These experiments appeared to demonstrate convincingly that evolutionary forces had favoured the evolution of a parental bond in order to promote survival of young animals, and that the child's tendency to cling to a parental figure is a primary instinct, and not secondary to some other form of reinforcement such as nutrition.

Thus, drawing on evidence from his own research, and that of others, as well as insights from ethology, cognitive psychology, evolution, and biological systems theory, Bowlby (Bowlby, 1969, 1973, 1980) proposed an alternative account to explain the nature of the child's tie to the mother. According to Bowlby, human infants develop attachments to caregivers because it would have been evolutionarily adaptive to have done so. The infant's intense affective tie to caregivers is not the byproduct of a more fundamental drive or motivation. Instead, according to Bowlby, attachment represents a primary, biologically-based motivational system, selected through evolution to promote survival and inclusiveness fitness through maintenance of proximity to a primary caregiver(s) (the neo-Darwinian term inclusive fitness was incorporated into later editions of Bowlby's Attachment and Loss trilogy (see Fraley, Brumbaugh, & Marks, 2005; Simpson & Belsky, 2008).

Drawing on systems theory, Bowlby claimed that attachment behaviors are organized into an attachment behavioral system, in which the specific attachment behaviors are less important than the internal organization of such behaviors towards the goal of proximity. Bowlby adopted a control systems approach in which the attachment behavioral system becomes activated by both internal and external cues that signal potential threat. Once activated, the attachment system recruits a flexible set of behaviors (e.g., crying) organized around the goal of establishing contact with an attachment figure. Once the child's desired proximity to the caregiver is achieved, and a reduction in the perceived degree of threat occurs, there is a decrease in the activation of the attachment system, resulting in the termination of attachment behaviors. Bowlby theorized that the child's desired degree of proximity to the caregiver might depend on a number of factors, including (a) child conditions (e.g.,

child health), (b) mother conditions (e.g., quality of caregiving), and (c) environmental conditions (e.g., familiarity with the environment).

Bowlby (1969) also provided an account of the normative development of the parent-child attachment relationship, which highlights a hallmark of Bowlby's attachment theory—*universality*. According to attachment theory, essentially all infants are born with the building blocks that develop into the attachment behavioral system. All that is necessary for the infant to develop an attachment to a caregiver is that the caregiver has been interactively present over an extended period of time.

As described by Bowlby (Bowlby, 1969), the normative developmental course of this relationship is believed to unfold through the series of four phases (see Marvin & Britner, 2008). Although Bowlby characterized attachment during these periods as undergoing distinctive shifts, he emphasized that the boundary between one phase and the next is blurred. The first phase, *orientation and signals with limited discrimination of figure* (birth to 2-3 months), is characterized by the infant being responsive to all social stimuli. According to Bowlby, infants respond to social stimuli in ways that promote continued social interaction, and attachment behaviors, in particular, are crucial in eliciting caregiving behavior from adults. During this phase, infants' signals are not directed toward any particular person, a feature Bowlby viewed as adaptive, as it would have promoted infant survival, even if the infants' biological caregiver were not available (e.g., if mother died after giving birth). During the second phase, *orientation and signals directed towards a discriminated figure* (2-3 months – 7 months), the infant begins to discriminate specific caregivers from strangers, attachment behaviors are activated and terminated by these specific caregivers, and preference for a particular caregiver begins to develop. The third phase, *maintenance of proximity to a discriminated figure* (7 months – 3 years), is characterized by the

emergence of active attachment behaviors that the infant is able to more flexibly alter to achieve the goal of proximity. Goal-corrected behavior begins to be evident, as the infant begins to use the caregiver as a secure base from which to explore the environment and as a safe haven to retreat to in times of threat or challenge. It is early in this phase that the infant is said to become attached to the caregiver in a clear-cut, qualitative sense (and when stranger anxiety emerges). Finally, the fourth phase in the development of the attachment relationship is the *formation of a goal-corrected partnership* (beginning at around 3 years) between the child and caregiver. With the development of language and other cognitive skills, the child becomes able to consider the mother's perspective and consider her wishes in guiding the child's behavior. Thus, the relationship becomes more like a partnership, whereby the child weighs both the parent's and his or her own goals in planning behavior, and attachment needs can increasingly be negotiated collaboratively between parent and child.

Inherent in this view of development is the idea that personality becomes increasingly complex at every stage of development and that, with development, the child becomes a stronger force in determining developmental pathways (Bowlby, 1969). Thus, Bowlby believed that early social experiences have important implications for subsequent development, with initial adaptations within relationships with primary caregivers serving to lay the foundations for subsequent development. In addition, Bowlby proposed that early experiences color encounters with later experiences through the action of working models, or cognitively embedded abstractions of direct experiences with caregivers. As described in more detail below, such working models are carried with individuals into novel situations, informing expectations and behavior in novel interpersonal contexts.

Thus, it is fair to say that in its initial formulations, Bowby's attachment theory was primarily concerned with the fundamental nature of attachment, its evolutionary and biological dimensions, its development, and the impact on personality development of major disruptions to the integrity of the attachment bond, such as permanent or lengthy separation, or bereavement. It was through his collaboration with Mary Ainsworth that the theory broadened to incorporate variations in the quality, or security, of attachment in circumstances where no major disruptions to the integrity of the bond had occurred. This represents a critical turning point for attachment research in two fundamental respects. First, with this new perspective and the now-famous tools that Ainsworth and others developed for rigorously assessing individual differences in the organization or quality of attachment there opened up a highly tractable set of scientific possibilities that were to generate a vast wealth of important findings that has given the field much of its momentum ever since. Second, it represented a shift of focus to a different set of populations—initially children experiencing major separation or privation of attachment experiences, then subsequently to children having experienced a continuous and unbroken bond with their stable caregiver (in most cases their biological parent), but who vary in how their attachment relationship and their own attachment behaviour is organised. Crucially, this shift moved the field to focus on fundamentally different aspects of attachment. Bowlby's early thinking was focused on the mechanisms by which a bond is established and what effects occur when it is disrupted. The later work on attachment tended not to address this, and instead examined how attachment behaviour towards a consistent caregiver is shaped by that caregiver's behaviour, particularly sensitivity.

We can think of these two different lines of inquiry as being fundamentally concerned with *attachment formation* on the one hand, *and attachment organization* on the other. Although research on attachment organization has blossomed, much less is known about the processes that shape attachment formation. Nevertheless, this latter topic is of great significance for attachment researchers and developmental psychopathologists, and has seen a relatively recent resurgence, as scientists have begun to rigorously study the impact of institutional rearing on children's growth and development and interest in the so-called attachment disorders has grown dramatically (e.g., see van IJzendoorn et al., 2011). It is also interesting to note that much, though not all, animal research on attachment has continued in the early tradition – examining the biobehavioral effects of separation and the role of critical periods in early development (Hofer, 1994). Bringing together our understanding of these different aspects of attachment and integrating the methods, findings and insights arising from the study of them is an important long-term goal for the field and a key priority if we are to advance attachment theory's capacity to inform understanding and treatment of psychological disorders. A proper treatment of the impact of institutional rearing, of severe privation more generally, and of the so-called reactive attachment disorders is beyond the scope of this chapter. However, the interested reader is encouraged to study the monographs of Kumsta et al. (Kumsta et al., 2010) and McCall, van IJzendoorn, Juffer, Groark, and Groza (2012), as well as the review paper by Rutter, Kreppner, and Sonuga-Barke (2009).

Individual Differences in Attachment

As emphasized in the preceding section, Bowlby's major contribution to attachment theory was in the formulation of the basic tenets of the theory.

Notwithstanding her important role in refining and elaborating that theory, Ainsworth's key contribution was the development of the methodology for testing it. Her seminal theorizing and ground-breaking research was vital for the field, by making possible the systematic assessment of individual differences in the quality of parent-child attachment relationships (Ainsworth, Blehar, Waters, & Wall, 1978a), and by richly documenting the interactive processes taking place between parent and child that offered a plausible account of the origins of such individual differences (Ainsworth, 1967; Ainsworth, et al., 1978a).

Ainsworth's key work, which built upon her earlier observational research in Uganda, and drew inspiration from her collaboration with Bowlby and her training in 'security theory' (Blatz, 1966), was to become a template for how to study the development of parent-infant relationships in naturalistic settings. Critically, it led to the development of what has now become the most widely used procedure for assessing individual differences in the infant-caregiver attachment relationship, the Strange Situation Procedure (Ainsworth, et al., 1978a; Ainsworth & Wittig, 1969). This 20-min procedure originally developed for 12- to 18-month-olds was designed to examine the balance between the infant's attachment and exploratory behavioral systems. Importantly, it capitalizes on several key anxieties that peak in infants at this age, including stranger anxiety and separation anxiety, to observe the infant's use of the caregiver as a secure base and safe haven. Over the course of the Strange Situation, the infant goes through a series of mildly stressful experiences designed to activate the attachment bio-behavioral system. The Strange Situation begins with the infant and caregiver being introduced to a novel laboratory setting, with toys for the infant placed in the center of the room and seating for the mother on the perimeter. After three minutes, in which the infant is encouraged to play with the toys while the

mother is seated at a distance, a stranger enters the room. While the stranger interacts with the infant, the mother departs from the room, leaving the infant in the room with the stranger. After three minutes (or less if the infant becomes distressed), the mother returns and the stranger leaves. Shortly thereafter, a second, more stressful separation occurs when the mother leaves the infant alone in the room. After a maximum of three minutes alone, the stranger returns, followed thereafter by the mother.

Individual differences in infant attachment in this procedure are revealed in the infants' flexible transition between using the caregiver as a secure base to explore the environment and as a safe haven in times of uncertainty. Based on the patterning of infants' secure base and safe haven behavior—particularly during the two reunion episodes—Ainsworth and her colleagues (1969; 1978a) established that the majority of infants demonstrated what became referred to as a *secure* attachment pattern. Such infants are able to use their caregiver as a secure base of exploration, evidenced in their exploration of toys at a distance from the caregiver in the novel laboratory environment. Although they may check back with caregivers, especially when the stranger enters, they appear confident to explore the environment. When separated from caregivers, infants classified as secure may become distressed, and, if they do, they use the caregiver as a source of effective comfort. Prototypically, the distressed secure infant seeks the caregiver upon reunion, is comforted by his/her presence, and eventually returns to exploration. Even if not overtly distressed by the separation, infants classified as secure tend acknowledge the return of the caregiver, greeting the caregiver and initiating interaction.

In contrast to secure infants, insecure infants appear unable (or less able) to effectively use the caregiver as a secure base and/or safe haven. Based on variations in these behavioral themes, Ainsworth and her colleagues identified two types of

attachment insecurity—avoidance and resistance. A large minority of insecure infants are classified as avoidant. *Avoidant* infants may explore the environment by engaging the toys before the separation. However, upon reunion, instead of acknowledging the caregiver's return, avoidant infants ignore or actively avoid their caregiver. A small minority of insecure infants are classified as resistant. *Resistant* infants tend to stay close to the caregiver and typically do not engage in play even prior to the first separation episode. When separated from the caregiver, resistant infants often become quite distressed, yet seem unable to use their caregiver effectively as a way of gaining comfort from distress upon reunion. Such infants exhibit a kind of behavioral ambivalence, simultaneously signaling their desire for proximity, yet appear angry and resist contact when it is achieved.

Even though Ainsworth's pioneering study only comprised a small cohort of children, in many respects, this early work—and subsequent research conducted with Everett Waters' Attachment Q-Set (AQS, Waters & Deane, 1985) for characterizing children's secure base behavior in naturalistic settings—has scaled up quite well. Remarkably consistent evidence across all cultures in which individual differences in security have been examined provide evidence that the majority of infants demonstrate secure attachment patterns. In addition, such work has provided evidence that avoidant and resistant patterns of attachment behavior can be reliably identified in a minority of infants across cultures (although the distribution of these classifications has been found to vary both within and between cultures; van IJzendoorn & Sagi, 1999).

Another key contribution of this work is that Ainsworth demonstrated via extensive home observations that the individual differences observed in the laboratory Strange Situation mapped onto individual differences in the parenting children

experienced in more naturalistic environments (Ainsworth, et al., 1978a). Ainsworth and her colleagues developed behavioral rating scales for systematically assessing the quality of mother caregiving behavior, which were to become extremely important for subsequent observational studies and for inspiring attachment-focused interventions. Analyses linking such caregiving behavior to infant attachment revealed that mothers who were more sensitive in their interactions with their infant, characterized by their awareness of, and prompt responsiveness to, infant attachment signals, were more likely to have a securely attached infant. Such evidence greatly contributed to theorizing regarding the origins of infant attachment variation. Indeed, virtually all hypotheses regarding the antecedents of individual differences in attachment, at least within attachment scholarship, emphasize environmentally mediated, and in particular, *interpersonal* processes that give rise to secure versus insecure attachment, with the dominant theoretical account being that secure parent-child attachment relationships largely result from sensitive exchanges between caregivers and children. Regarding the origins of the specific patterns of insecurity, it has been argued further that particular types of insensitive parenting give rise to avoidant versus resistant attachment patterns. Specifically, rejecting caregiving is thought to lead to the development of avoidant attachment, as a history of having attachment signals rebuffed by caregivers might understandably lead infants to develop a strategy of minimizing attachment behavior. On the other hand, inconsistently responsive caregiving is thought to promote the development of resistant attachment because such caregiving might lead the infant to develop a strategy of emphasizing or heightening the expression o attachment behavior (see Belsky & Fearon, 2008).

Shortly after Ainsworth and her colleagues introduced the Strange Situation to the field, evidence was presented that attachment behaviors were not highly inter-

correlated, exhibited only weak stability over time, and varied across contexts (e.g., Coates, Anderson, & Hartup, 1972; Maccoby & Feldman, 1972), leading some to question not only findings from Ainsworth's work, but also the usefulness of the construct of attachment itself (Cairns, 1972; Gewirtz, 1972a, 1972b; Masters & Wellman, 1974; Rosenthal, 1973; Weinraub, Brooks, & Lewis, 1977). However, these critiques focused on the wrong level of analysis of attachment, at least from the point of view of attachment theorists (Sroufe & Waters, 1977).

The attachment bio-behavioral system, according to Bowlby, Ainsworth and others, operates at the level of the goal-directed organization of attachment behavior within the individual, and in a given context. The emphasis thus is not on specific attachment behaviors, but on the patterning of such behaviors and what ends they are organized to achieve. For example, under conditions of threat, the infant may try any number of attachment behaviors (e.g., crying, crawling) to gain proximity to the caregiver, depending in large part on the context and the child's capabilities. Further, the behaviors enlisted by the attachment system are expected to change over the course of development, with, for example distance interaction (including through language) becoming more significant in toddlerhood than in infancy (Ainsworth, 1972; Bowlby, 1969; Sroufe & Waters, 1977).

As best articulated by Sroufe and Waters (1977), this distinction between attachment behaviors and the attachment behavioral system is fundamental to the operationalization of individual differences in attachment security. When viewed as an organizational construct, evidence of weak associations among specific attachment behaviors and their weak stability over time and across contexts becomes largely irrelevant to the theory. Instead, what matters is the organization of such behavior around the caregiver within specific contexts (Ainsworth & Bell, 1974). The stability

of patterns of attachment as measured at an organizational level is, however, a critical question; one that we return to in a later section.

The standard conceptualization of individual differences in attachment as originally formulated by Ainsworth and her colleagues has also been met with some ultimately generative challenges over the years. As more researchers began to use the Strange Situation, it became increasingly apparent that not all children could be classified as either secure, avoidant, or resistant using the traditional classification system. As first noted by Mary Main and her colleagues (Main & Hesse, 1990; Main & Solomon, 1986, 1990), a subset of infants (especially those living under conditions of high stress or abusive conditions), in addition to exhibiting these organized patterns of attachment behavior in the Strange Situation, also displayed momentary, yet striking, anomalous behaviors suggestive of a "breakdown" or *disorganization* of their attachment-relevant strategy. For example, throughout the course of the Strange Situation, such infants might exhibit stilling or freezing behaviors (i.e., frozen postures believed to represent indication of an approach-avoidance conflict), stereotypies or marked contradictory behavior (e.g., strong approach followed by sudden avoidance). Or such infants may hit the parent in apparently positive mood or exhibit direct fear of the parent without apparent reason at reunion. In short, disorganization may manifest itself in a variety of ways, yet the common theme is that such displays of conflicted, contradictory, or disoriented behaviors are indicative of a profoundly disturbed relationship with the attachment figure and of being unable to maintain an organized behavioral strategy when distressed.

Moreover, unlike the organized patterns of attachment (secure, avoidant, resistant) that are thought to result from variation in the sensitivity of caregiving, disorganized attachment is thought to result from frightening (e.g., abusive) or

frightened (e.g., caregiver exhibits behavior indicative of apprehension of infant) caregiving. Such caregiving is believed to present disorganized children with an irresolvable dilemma in which the very individuals they are evolutionarily predisposed to seek out under conditions of threat are, in fact, a source of fear for the infant. According to the most influential model of disorganized attachment proposed by Main and Hesse (1990), fear, with the parent as its source, creates for the child an approach-avoidance conflict, in which the mutually opposing action tendencies of proximity seeking and avoidance vie for control of behavior. These opposing tendencies are believed to give rise to the oscillatory, fragmentary or contradictory behaviors characteristic of disorganized attachment.

A second challenge to the validity of the standard view of individual differences in infant attachment security has emerged as a result of more recent taxometric and factor analytic work conducted by Chris Fraley and Susan Spieker (2003) based on the NICHD Study of Early Child Care and Youth Development (SECCYD), one of the largest studies of the Strange Situation conducted to date (original N = 1,364). Fraley and Spieker's (2003) study focused on the distributional properties and latent structure of individual differences in infant attachment, and findings from their taxometric analyses have provided some evidence that instead of being categorically distributed, variation in attachment security may be compatible with a model in which individual differences in attachment are continuously distributed (see also Kroonenberg & van IJzendoorn, 1987; Richters, Waters, & Vaughn, 1988).

Fraley and Spieker (2003) also presented results from exploratory factor analyses demonstrating that attachment-related individual differences vary along two weakly correlated axes—one of attachment-related avoidance and one of attachment-

related resistance (the latter a combination of resistance and disorganization indicators). Such findings challenge the current conceptualization of variation in attachment, in which it is implied that avoidance and resistance are mutually exclusive insecure organizations of attachment behavior. More specifically, such evidence raises the possibility that resistance and disorganization may not be empirically distinct and that an infant can be simultaneously high or low on avoidance and resistance or high on one dimension and low on the other. As discussed further below, combined with similar evidence that has emerged from taxometric and factor analytic work (e.g., Fraley & Roisman, in press; Haltigan, Roisman, & Haydon, in press; Roisman, Fraley, & Belsky, 2007) on the most widely used developmental measure of adult attachment, the Adult Attachment Interview (AAI, Main, Kaplan, & Cassidy, 1985), we caution that some of the conclusions of prior research might need to be reevaluated in light of such emerging evidence that individual differences in attachment might be best represented by two weakly correlated dimensions reflecting attachment-related avoidance and anxiety. Indeed, one contributing factor to some of the mixed evidence regarding the distinctive antecedents and consequences of attachment variation might be the imperfect relationship between existing measures and their underlying latent structure. This possibility requires further exploration. One key limitation of existing taxometric studies is the reliance on rating scales whose individual validity and sensitivity have received relatively little attention. One particularly critical issue is whether the overlap currently observed in the dimensional framework between resistance and disorganization should be taken as an indication of their common underlying meaning, or a limitation in the way the two constructs are measured. Further work directly contrasting these differing measurement approaches

in terms of their distinct or common outcomes or antecedents is an important area for future research.

Internal Working Models of Attachment

In contemporary attachment theory, and in keeping with Bowlby's original proposals, attachment behaviors in infancy are thought to be guided by underlying cognitive structures. These internal working models are thought to consist of representations of the parent, the self and the attachment relationship that are derived from day-to-day experiences with the caregiver. Through repeated interactions the infant is thought to derive a set of interactional schemas or models of the attachment relationship which include sensorimotor, cognitive and affective components. These representations are seen as a set of expectations regarding the future behaviour of the attachment figure that allow the infant to act rapidly and adaptively in the event of threat in accordance with the demands of the immediate situation and the likely actions of the parent. The Strange Situation, and other attachment assessments, are considered windows into the infant's internal working model of the attachment relationship.

Since Bowlby's early writings on internal working models several researchers have made efforts to recast his ideas in terms derived from modern theories of infant cognition and event representation. Most notable amongst these attempts has been the work of Inge Bretherton (Bretherton, 1990, 1995), who suggested that Bowlby's view of internal working models of attachment is highly compatible with Schank and Abelson's notion of scripts (Schank & Abelson, 1988). In Schank and Abelson's model infants are thought to extract constancies and generalizations from stored memories of repeated events. These invariant aspects of interactions come to form the

basis of higher-order representations or schemas of the relational structure of interactions. Through a continual process of integration and cross-referencing of new information with existing schema the infant develops a set of horizontally and vertically integrated representations that encode the spatio-temporal structure of common events (Bretherton, 1995). Event-schemas include information that is event-near (specific interaction type) as well as higher-level representations that involve generalizations across many event classes (such as general representations of parental accessibility).

The conceptualisation of attachment behaviour as the functioning of internal working models of attachment has had a major impact on thinking in attachment theory and research and has played a vital role in the understanding of the organization of attachment behaviour. Internal working models have been especially important in extending attachment theory beyond infancy into later childhood and adulthood (Greenberg, Cicchetti, & Cummings, 1990; Main, 1991; Main, et al., 1985). The most important contribution to this development was made by Main and her colleagues (Main, Goldwyn, & Hesse, 2003; Main, et al., 1985). Main and colleagues reformulated the concept of an internal working model from something predominantly behavioural and affective in nature to a representational construct, controlling behaviour thinking, feeling, cognition and language. More specifically, according to Main et al. (1985):

"*We define the internal working model of attachment as a set of conscious and/or unconscious rules for the organization of information relevant to attachment and for obtaining or limiting access to that information, that is, to information regarding attachment-related experiences, feelings and ideations*." (Main et al, 1985)

This crucial reformulation opened up the possibility of investigating the organization and development of internal working models across the lifespan. The so-called 'move to the level of representation' focused attention on narrative patterns as the expression of the organisation and functioning of internal working models of attachment at a cognitive level and has become fundamental for assessing attachment beyond the preschool years.

Measurement of Individual Differences in Attachment

Bowlby (Bowlby, 1969) proposed that attachment relationships continue to be relevant across the life course. Initial efforts to assess individual differences in attachment were focused on children, but as interest in attachment across the lifespan grew, assessments of attachment in adulthood were developed. More recently, there has also been increasing interest in children's attachment representations, leading to a number of representational assessments of attachment being developed for use in early and middle childhood. In this section, we provide an overview of these attachment assessments, specifically focusing on those assessments that are most commonly used within the field of developmental psychology.

Childhood Attachment Assessments

Behavioral Assessments of Attachment. The most commonly used measure of attachment in infancy is the Strange Situation Procedure (Ainsworth, et al., 1978a; Ainsworth & Wittig, 1969). As we have already extensively discussed this assessment, we turn our attention here to other behavioral assessments of attachment used in early childhood. In addition to providing an overview of these assessments, we also provide evidence regarding the association between individual differences in

attachment security as assessed with these attachment measures and as assessed by the Strange Situation. A more extensive discussion of the stability of attachment security across the life course is provided later in this chapter. However, because the Strange Situation generally serves as the standard by which all other attachment assessments are evaluated, we briefly discuss such evidence here when relevant data are available.

Several procedures designed to assess variation in attachment security beyond infancy have been developed that involve modifications of the standard Strange Situation Procedure, including the Cassidy-Marvin assessment of attachment for preschoolers (Cassidy, Marvin, & The MacArthur Working Group on Attachment, 1992) and the Main-Cassidy assessment of attachment for kindergarten-aged children (Main & Cassidy, 1988). These modified Strange Situation Procedures are similar to the Strange Situation, except that the caregiver and child are separated for a longer duration, a manipulation that is believed to elevate the level of stress in the child. As with the original procedure, in these modified Strange Situations, children's separation and reunion behavior are generally coded using similar categories to those used in the Strange Situation (secure, insecure-avoidant, insecure-resistant, disorganized) based on the child's ability to use the caregiver as a secure base and safe haven. Several longitudinal studies have included measures of both the Strange Situation and these modified Strange Situations, allowing for examination of the concordance between individual differences in attachment as assessed with these measures. Many of these studies have demonstrated stability in attachment security (vs. insecurity), and in studies in which discontinuity was found, it was lawful, in that shifts in security were explained by corresponding changes in mother-child interaction or changes in other attachment-relevant contextual variables (e.g., marital

distress and separation, negative life events; Ammaniti, Speranza, & Candelori, 1996; Howes & Hamilton, 1992; Jacobsen, Huss, Fendrich, Kruesi, & Ziegenhain, 1997; Main, et al., 1985; Wartner, Grossmann, Fremmer-Bombik, & Suess, 1994).

In contrast to the Strange Situation and modified Strange Situation, in the Attachment Q-Set (AQS, Waters & Deane, 1985), observations are conducted in the home for 2-3 hours or longer. This assessment was developed as an alternative to Ainsworth's extensive home observation narratives collected in the context of her Baltimore study that were used to validate the Strange Situation. Based on home observations, 90 cards reflecting aspects of secure base behavior are sorted into nine piles based on the extent to which the cards describe behavior characteristic of the child's observed behavior. The sort is then compared with a prototypical sort to assess attachment security continuously. A meta-analysis of over 100 investigations comprising over 13,000 children using the AQS conducted by van IJzendoorn and colleagues (van IJzendoorn, Vereijken, Bakermans-Kranenburg, & Riksen-Walraven, 2004) provided important information regarding the validity of this attachment assessment. Findings from this meta-analysis indicated a modest association between security as measured by the Strange Situation and the AQS (r = .23) and also indicated that the mother-reported AQS is not as psychometrically valid or reliable as the observer-reported AQS. Mother-reported AQS security exhibited a relatively weak association with security as assessed by the Strange Situation (r = .14) and a moderate association with temperamental reactivity (r = .35).

Representational Assessments of Attachment. As noted above, internal working models are believed to be encoded primarily in sensorimotor representations, making the behavioral assessments of attachment described above particularly appropriate. Indeed, the quality of the attachment relationship is readily observable in

the organization of the child's behavior around the caregiver in infancy and early childhood. With increased cognitive capacity, however, fewer stimuli elicit such strong manifestations of attachment behavior, making it increasingly difficult to assess individual differences in the quality of attachment relationships on the basis of the organization of manifest attachment behavior as the child matures. In addition, beginning in the preschool years, children begin to use symbolic forms of representation and to organize knowledge conceptually (Bretherton, 2005), allowing for the use of representational assessments of individual differences in attachment. Accordingly, there is a move in the assessment of individual differences in attachment from the level of behavior in infancy to the level of representation in childhood and adulthood.

A number of representational assessments of attachment have been developed for use in childhood. Such measures largely fall into three categories, (1) picture-response procedures, (2) doll-play scenarios, and (3) family drawings. There are far too many assessments of children's attachment representations to comprehensively review here (but see Solomon & George, 2008); thus, we focus our discussion on a general overview of these three categories of representational assessments. Picture-response procedures involve a series of pictures depicting a range of mildly to moderately stressful attachment-relevant scenarios (e.g., child watches parent leave), to which the child is asked to describe how the child in the scene feels and what the child will do (Klagsbrun & Bowlby, 1976). Both a classification system (Kaplan, 1987) that parallels the one used in the Strange Situation and attachment-relevant rating scales (Slough & Greenberg, 1990) have been developed to code children's responses on this task. Several prompted story-telling procedures using doll play have also been developed (e.g., the MacArthur Story Stem Battery, Bretherton &

Oppenheim, 2003; Attachment Story Completion Task, Bretherton, Ridgeway, & Cassidy, 1990; Manchester Attachment Story Task, Goldwyn, Stanley, Smith, & Green, 2000; Attachment Doll-Play Interview, Oppenheim, 1997), and these procedures generally involve the narration and enactment of a series of attachment-relevant stories. Each story contains an attachment-relevant problem that occurs (e.g., child is hurt, parent-child separation). This problem is introduced by the adult, after which the child is prompted to enact the rest of the story. As with the picture response procedures, both classification systems and attachment-relevant scales have been developed to code children's narratives. Finally, in family-drawing procedures, children are asked to draw a picture of their family, and such drawings are evaluated using a classification system that parallels the one developed by Ainsworth for the Strange Situation (Kaplan & Main, 1986).

The diverse approaches to assessing attachment representations in childhood have been beneficial in that multiple measures allow researchers to thoroughly test the construct in a variety of ways. However, there is currently no dominant conceptual or methodological approach, and because researchers have primarily focused on assessment creation, information regarding the reliability and validity of the assessments is limited to only a handful of studies for each measure without independent tests (see Kerns, 2008; Solomon & George, 2008). Although this area of attachment research has produced many potentially useful measures of children's attachment representations, more research focused on the (discriminant) validity of the measures is needed, for example taking careful account of verbal abilities (which otherwise may lead to spurious findings and artificial gender differences).

Adult Attachment Assessments

In adolescence and adulthood, narrative-based measures are the most common way that researchers have approached the assessment of individual differences in attachment. As noted earlier, Mary Main and her colleagues developed the first of such assessments, the Adult Attachment Interview (AAI, George, Kaplan, & Main, 1985), which is a semi-structured interview in which adults are asked to describe their early experiences with attachment figures and to provide autobiographical memories to support their evaluations of such experiences. Narratives produced within the context of the AAI are evaluated based on coherence, or the extent to which narratives are internally consistent without becoming emotionally overwrought. Paralleling the Strange Situation, individuals are typically classified by AAI coders into one of three categories. The majority of adults, classified as *secure-autonomous,* produce narratives characterized by the ability to freely and flexibly evaluate childhood experiences, regardless of whether they are described in retrospect as supportive or difficult in nature. A smaller, although substantial, number of adults defensively distance themselves from the emotional content of the interview by normalizing harsh experiences, claiming an inability to recall past experiences, and/or idealizing caregivers and are classified as *insecure-dismissing*. Finally, a small minority of adults are classified as *insecure-preoccupied* and are unable to discuss early attachment-relevant experiences without becoming emotionally overwhelmed, as reflected in the production of narratives characterized by becoming either angrily or passively enmeshed in prior experiences with caregivers. In addition to classifying individuals into one of these mutually exclusive groups, individuals may also be classified as unresolved if their discourse becomes disorganized in the context of

discussing the loss of a close loved one or experiences of abuse (see Bakermans-Kranenburg & van IJzendoorn, 2009; Hesse, 2008).

The AAI was developed with the aim of identifying individual differences in parents' representations of early attachment-relevant experiences according to individual differences in the quality of the attachment relationship infants developed with their parent. Accordingly, individual differences in parents' attachment representations as assessed by the AAI would be expected to map onto individual differences in their infant's attachment security. Indeed, a meta-analysis of 18 studies comprising 854 parent-child dyads indicated strong intergenerational continuity in attachment security (vs. insecurity; $r = .47$; van IJzendoorn, 1995).

Recently, Harriet Waters and her colleagues introduced the Attachment Script Assessment (ASA; H. S. Waters & Rodrigues-Doolabh, 2004), another narrative-based assessment of adult attachment in which adults are asked to develop attachment-relevant narratives using a set of words provided to them. Narratives produced within the context of the ASA are evaluated for adult's access to a secure-base script, as reflected in adults' ability to develop coherent, non-autobiographical, attachment-relevant narratives. More specifically, narratives are rated on a 7-point scale of secure base script knowledge for the extent to which they are organized around a secure base script. Narratives receive high scores if they contain a clear secure-base structure in which attachment-relevant threats are recognized, competent help from an attachment figure is offered, such help is effective in resolving the problem, and the situation returns to normal. Narratives receive low scores if they lack this secure-base structure and/or include bizarre details (e.g., one of the members of the attachment relationship dies; see H. S. Waters & Waters, 2006)

In both attachment assessments, the narratives that adults produce, whether in relation to autobiographical attachment-relevant life stories in the case of the AAI or in relation to generic attachment-relevant stories in the case of the ASA, are implicitly evaluated by trained coders for adults' access to a secure attachment-relevant script—or an understanding that effective attachment relationships serve the complementary functions of the provision of a secure base of exploration and a safe haven in times of uncertainty (see Roisman, 2007). Given the similarity between the AAI and the ASA, it is not surprising that, at least in preliminary studies based on relatively modest samples, adults' coherence as measured by the AAI is highly correlated with adults' secure base script knowledge as assessed by the ASA (*r*'s range from .50 - .60; H. S. Waters & Waters, 2006). In addition to the conceptual convergence of the AAI and ASA, there is increasing evidence for the empirical convergence of these assessments. Specifically, individual differences in adult attachment as assessed by both the AAI and ASA have been found to predict infant attachment security (Bost et al., 2006; Verissimo & Salvaterra, 2006) (van IJzendoorn, 1995), maternal sensitivity (Coppola, Vaughn, Cassibba, & Costantini, 2006; De Wolff & van IJzendoorn, 1997), and physiological reactivity when confronted with attachment-relevant challenges (Beijersbergen, Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2008; Dozier & Kobak, 1992; Groh & Roisman, 2009; Holland & Roisman, 2010; Roisman, Tsai, & Chiang, 2004). However, more work—in particular, focused on the developmental antecedents of variation in individual differences in attachment as assessed by the ASA—is needed to determine whether the ASA serves as a rough proxy for the AAI, which is a more costly measure in terms of both time and monetary expense (e.g., training, transcription, and coding).

The determinants of individual differences in attachment

Since the outset, the causal determinants of variations in attachment behavior have been a central concern of attachment researchers. As noted already, the preeminent causal influences on the development of individual differences in young child's attachments are believed to be located within the patterning or quality of parent-child interactions. Furthermore, contemporary theorizing about the origins of individual differences in attachment place great emphasis on the intergenerational transmission of patterns of attachment from parent to child, driven in large part by the adult's internal working model, or state of mind with respect to attachment (Main, et al., 1985; van IJzendoorn, 1995). In the following sections, we review the evidence in support of this, and examine the evidence for alternative explanations including temperament, genetics, and other domains of parental behavior.

Intergenerational transmission

As noted previously, one of the most robust and well replicated predictors of individual differences in attachment security and insecurity is the parent's state of mind with respect to attachment, as assessed using the Adult Attachment Interview (van IJzendoorn, 1995). Van IJzendoorn's (1995) meta-analysis consisted of 18 studies that involved assessments of both parental AAI (either mother or father) and infant security of attachment measured either by the Strange Situation or the AQS. Overall, the net association across studies conducted at that time was very substantial, representing a correlation of .47 (which was homogeneous across studies). Indeed, only two studies in the meta-analysis failed to find cross-generational correspondence between the AAI and the Strange Situation (see van IJzendoorn, 1995). Overall, the 3-way match between infant and parental attachment status was 70% (n= 661). The only significant moderator of the effect of overall parental security on infant security

was the child's age at the time of the attachment assessment, with smaller effect sizes for groups of older children. The effect of Dismissing adult attachment status on infant avoidance was also substantial with an effect size r = .45, although there was also significant between-study heterogeneity. Analyses of potential moderators also revealed some interesting differences between studies. Generally speaking maternal Dismissing status was more strongly related to infant avoidance than was paternal Dismissing classification and, as before, samples of older children produced smaller effect sizes. For parental Preoccupation, a marginally smaller although nonetheless highly significant association emerged with infant resistance (d = .91, r = .42). There was again significant heterogeneity in effect sizes across studies. Two study characteristics appeared to explain some of this between-study variability - samples of older adults generated smaller effect sizes, as did samples from non-American populations. Finally, there was significant correspondence between parental lack of resolution of mourning and infant disorganised attachment status with a combined effect size of .65, equivalent to a correlation of .31. An analysis based on 4-way classifications of the AAI showed similar results as the above 3-way results with the notable exception of the association between parental preoccupation and infant resistance, which was considerably weaker once parental U status and infant disorganisation were taken into account (d = .39, r = .19).

In the same paper, van IJzendoorn (1995) was able to examine the association between parental state of mind with respect to attachment and their observed caregiving behaviour, which also revealed quite large effects (meta-analytic average r = .34). By the application of the tracing rules of path analysis, van IJzendoorn highlighted an important possible paradox. The direct effect of adult attachment on infant attachment (r = .47) was substantially larger than the estimated mediating

pathway between adult attachment status to child security via the parent's caregiving behaviour (.34 [AAI to caregiving] x .32 [caregiving to attachment, as estimated from a previous meta-analysis] = .11). This led to the coining of the term the 'transmission gap', which refers to the fact that observational measures of parental care seemed unable to account for all of the (very large) association between the AAI and infant attachment security. How to make sense of this transmission gap has been, and continues to be, a key question for attachment research. In the next section, we examine in greater detail the evidence concerning the role of parental sensitivity in the development of attachment as it currently stands, and explore possible explanations for the so-called transmission gap. Before doing so, we should also note that it seems prudent, given the amount of time that has elapsed since this meta-analytic work, to assume that the effect size for the AAI-SSP link will have declined somewhat (Verhage et al., 2013).

Parental Behavior

Since Ainsworth's seminal work, the sensitivity of parental care has long been considered the primary determinant of variations in child attachment security. In Ainsworth's ground-breaking study (Ainsworth, et al., 1978a) she carefully documented, in great detail, and from lengthy observations in the home, the key features of parent-child interactions that appeared to distinguish secure from insecure attachments. A critical insight of Ainsworth's, which paralleled Bowlby's insight regarding the organizational nature of attachment, was that specific caregiving behaviors were less important than the way in which parental responses to the child's signals were appropriately matched to the particular needs and characteristics of the child as well as the situational and temporal context. In that sense, Ainsworth's conception of sensitivity is clearly an organisational construct, pertaining to the

caregiving system rather than the attachment system (see George & Solomon, 1999). Ainsworth defined sensitivity as the parent's ability to be appropriately responsive to the child's attachment cues, and distinguished 4 aspects:

1. Awareness of the child's cues
2. Appropriate interpretation of the child's cues
3. Timeliness of the parent's response
4. Appropriateness of the parent's response

According to Ainsworth, a parent scoring high on sensitivity is continually aware of the child's whereabouts, state, focus of attention, activities and feelings and so is able to detect quite subtle attachment cues, understand the context in which they occur, and notice the incipient signs of distress so that prompt and in some cases pre-emptive action can be taken. This awareness is no doubt partly what allows a sensitive parent to come to appropriate interpretations of what the attachment signals mean. On the other hand, insensitive parents, according to Ainsworth, may be aware of the child's cues but interpret them inaccurately and negatively, perhaps as a result of their own past experiences, biases or defences (Ainsworth, et al., 1978a). The kinds of interpretations Ainsworth had in mind here included those regarding the infant's subjective experience or mental state. Indeed, the parent's ability to think about and hold in mind the child's experience and to take that appropriately into account when attending to the child's needs was central to Ainsworth's thinking on sensitivity. For example, she stated that:

"Interpretation has three main components (a) her awareness, …, (b) her freedom from distortion, and (c) her empathy……. The mother must be able to empathize with her baby's feelings and wishes before she can respond with sensitivity." (Ainsworth et al., 1978a)."

The elaboration of the sensitivity construct to encompass the parent's mind-mindedness, insightfulness or reflective function (to be discussed below) is therefore a very natural evolution of Ainsworth's original thinking.

Even if a parent has noticed the infant's attachment cue, and correctly interpreted it, the parental response needs to be timely so that, from the infant's point of view, it is experienced as contingent upon his or her signal. According to Ainsworth the infant needs be able to connect, in time, his signal with the mother's response so he feels a sense of efficacy in having his needs met. Finally, the parental response itself needs to be appropriate and provide the infant with what it seems he needs. According to Ainsworth, these aspects of sensitivity collectively form steps in a chain of events that allows a parent to respond optimally to the child's attachment-related signals and communications. A thorough understanding of Ainsworth's definition of sensitivity is important when considering some of the complexities of the literature concerning the link between sensitivity and attachment. It is also essential when considering how attachment concepts can be translated into effective interventions aimed at promoting the quality of parental care (see below).

Since Ainsworth's early observations, which seemed to show a strong connection between attachment and sensitivity, an impressive database of findings has emerged, broadly confirming her original work (De Wolff & van IJzendoorn, 1997; Kroonenberg & van IJzendoorn, 1987). As the field developed and differentiated, a

wide range of ways of measuring sensitivity arose, and the constructs that were chosen as foci for investigating the antecedents of attachment broadened. Although the outcome of this work was not entirely uniform, it has become clear that secure attachment is associated with higher parental sensitivity, a finding replicated across numerous countries and social contexts (Belsky & Fearon, 2008). Summarizing the extant findings of the time, and following-up findings of previous work by Goldsmith and Alansky (1987), De Wolff and van IJzendoorn's (1997) meta-analysis of studies of sensitivity and attachment came to several key conclusions. First, across all studies included in the meta-analysis (k = 30, N = 1,666) the average correlation between sensitivity and attachment security was .22, which was highly significant, but also highly heterogeneous (i.e., the effect size varied substantially across studies to a degree greater than expected by chance). The broad trend across studies was thus entirely in keeping with Ainsworth's hypothesis, although for some scholars the effect size was interpreted to be smaller than expected. A second important finding to emerge from this meta-analysis was that when different characterizations of the sensitivity construct were analyzed separately, those studies that used Ainsworth's original definition (and rating scales) produced somewhat larger effect sizes (r = .24) than those more distantly related to the original. Notably, this latter set of studies was also homogeneous, meaning that across studies the variability in effect sizes was not greater than would be expected as a result of chance fluctuations, and no study characteristics were identified that moderated the effect size. Within the broader set of sensitivity studies however, a number of important moderators did arise. First, studies with older infants tended to produce larger effect sizes (older than age 1, r = .27) than those with younger infants (r = .20). Similarly, studies that measured attachment at later ages tended to obtain larger associations (r = .25) than those with younger age

groups (r = .19), as did studies with shorter time intervals between the assessment of sensitivity and attachment. These results might suggest that the attachment relationship, as indicated by parental sensitivity on the mother's side, and attachment security on the child's, coheres progressively over time (De Wolff & van IJzendoorn, 1997). As we will describe further below, the long-term predictive significance of attachment also appears to strengthen as attachment is measured later in development, which could also be taken to imply a gradual consolidating process taking place some time after the first or second year. One notable further development in the field is an increase in interest in the role of paternal sensitivity in the development of father-child attachment. A recent meta-analysis of 8 studies found a significant overall association (r = .13), although the effect size was clearly smaller than the meta-analytic average for mothers (Lucassen et al., 2011). A recent paper by Brown, Mangelsdorf and Neff (2012) found more robust associations between attachment and paternal sensitivity at age 3 (β = .53) than in infancy (β = .33), which mirrors the pattern referred to previously regarding mothers (De Wolff & van IJzendoorn, 1997). Whether this pattern is more marked in fathers is worthy of exploration, but currently we do not have direct evidence of this.

Despite the fact that meta-analytic work has identified study-level variables that seem to be associated with larger effect sizes, it is clear that at best the association between sensitivity and attachment is modest, and there may be several explanations for this (Belsky & Fearon, 2008). First, the modest association may result from a 'technological gap', resulting from limitations in the quality, intensity or context of measurement of sensitivity. There is no doubt that measurements of sensitivity (and indeed attachment) are noisy, and the extent of noise in any measure sets an upper limit on its capacity to correlate with a criterion (Shrout & Fleiss, 1979).

In that regard, work by Dallaire and Weinraub (2005) is notable. They analyzed data on maternal sensitivity across the first 6 years of life, using the NICHD Study of Early Child Care and Youth Development data set and found that although correlations between specific sensitivity indicators at one time point and the next were consistently in the *r* = .30 - .40 range, latent variables representing common variance amongst several indicators correlated at around *r* = .60. This latent variable approach removes some, though not all, of the measurement error in sensitivity assessments, and suggests that sensitivity may be a highly stable construct once error is partialled out. Furthermore, it indirectly suggests that the modest association between sensitivity and attachment might be substantially higher than is commonly assumed. If one assumes that only 70% of the variance in measurements of attachment and sensitivity is reliable (which may be generous given that reported inter-rater reliabilities are often close to this figure and this is only one source of unreliability), then a correlation of .24 rises to .34 after correction for attenuation. Higher levels of measurement error would of course lead to larger increases in the association after correction for attenuation. Measurement error is a (sometimes under-appreciated) key issue when interpreting results from observational studies (see also De Wolff & van IJzendoorn, 1997). These considerations also underline the importance of continuing to refine measurement protocols for attachment related constructs, so that more stable and reliable measurements can be obtained. A particularly important study in that regard was recently conducted by Lindheim, Bernard and Dozier (2011), who undertook 10 repeated home observations of sensitivity in a small (*N* = 25), high-risk sample of mothers and babies. Critically, they found insecure/non-autonomous mothers, as assessed with the AAI, showed greater variability in their sensitivity than secure/autonomous mothers, and that the lowest, but not the highest, level of

sensitivity observed during the repeated assessments discriminated non-autonomous from autonomous mothers. The same was true with regard to the discrimination of infants who were removed from the home due to child protection concerns. Lindheim et al. (2011) also plotted the degree of association between sensitivity and maternal state of mind as a function of the number of observation episodes, and found that it rose in a curvilinear fashion (increasing rapidly initially, then plateauing), from r = .37 for a single observation to r = .54 after ten observations. The steepest increment in predictive validity was observed between one and two observations, and inspection of the curve would suggest that three observations may represent the optimal balance between predictive validity and researcher burden. Though only a single study and in a small and high-risk sample, this study powerfully demonstrates the importance of studying the measurement properties of sensitivity assessments in order to minimise error. The same logic applies, of course, to measurements of attachment. In that context it may be significant that van IJzendoorn and colleagues (van IJzendoorn, et al., 2004) found the correlation between security derived from the AQS and the SSP to be stronger for studies that used longer observations when conducting the AQS (r = .23 for <1.5 hours, r = .42 for > 1.5 hours). Further work of this nature is vital for scientific studies aiming to reveal the etiological mechanisms driving the development of attachment and for practitioners who need to be able to reliably assess attachment and sensitivity as part of their routine work.

Aside from measurement error, other technological limitations may hamper efforts to find strong and consistent associations between sensitivity and attachment. One critical factor has been highlighted by two recent studies, which both indicate that sensitivity-attachment associations are stronger when the measurement context affords opportunity to observe the parent's sensitivity to the child's distress

(Gaensbauer, Connell, & Schulz, 1983; McElwain & Booth-LaForce, 2006). In the first (McElwain & Booth-LaForce, 2006), maternal responsiveness to distress at 6 months cues was found to be a somewhat stronger predictor of attachment than responsiveness to non-distress cues. However, as noted by Leerkes (2011), a substantial proportion of the sample did not become distressed during the observation and were therefore excluded from the analysis. To address this limitation, Leerkes (2011) observed mothers in two different tasks, one free play, the other involve two brief distress-eliciting tasks (each 4 minutes in duration, one fear-evoking, the other frustration-evoking). As predicted, sensitivity during the distress tasks was more robustly associated with attachment security than sensitivity in the free play context. Along similar lines, several studies have suggested that sensitivity may be a stronger predictor when the observational context places competing demands on the parent (Smith & Pederson, 1988). Such contexts may increase the frequency of distress cues emitted by the child, as well as possibly stretching parents' capacities in ways that may mimic common attachment and sensitivity experiences outside of the laboratory, and hence increasing ecological validity. Because of the extensive observations in the natural setting, the Maternal Behavior Q-set (MBQS, see Pederson et al., 1990) might nicely combine the two facets that seem important for valid sensitivity measurements: observation of infant distress episodes in combination with competing demands on the parent. This may in turn explain the apparently larger associations between attachment and sensitivity produced by studies using the MBQS. Interestingly though, when Atkinson and colleagues (2005) examined the contributions of sensitivity, as measured using the MBQS, and maternal security derived from the AAI, they did find strong associations between each of these and infant security, but they did not find strong evidence of mediation. In other words, despite the stronger

correlation between sensitivity and attachment when measured this way, sensitivity and adult attachment security were partially, if not largely, independent. As a consequence, despite the substantial variance in security being accounted for overall, a transmission gap nevertheless remained. As a rejoinder to this, the authors also noted that in both the samples they analysed (one using the MBQS, and another using an event-coding of a short lab observation), there was some indication that sensitivity and parental state of mind might interact to predict attachment security. In particular, sensitive parenting tended to 'block' the transmission of insecure patterns from parent to child (Atkinson et al., 2005).

Another relatively clear-cut piece of evidence seeming to implicate methodological factors in the modest association between attachment and sensitivity is the notable stronger association between attachment and sensitivity when attachment is measured using the Attachment Q-Set (average r = .39, see van IJzendoorn, et al., 2004). The AQS differs in several respects to the Strange Situation which may be relevant in interpreting this stronger association. First, it is based on a longer period of observation of behavior (typically 1.5 – 2 hours), and is conducted in the home environment. The AQS may therefore capture a larger sample of representative attachment behaviour than the Strange Situation. However, another important consideration is the age at which the AQS is usually conducted, which is generally between the ages of 2 and 3. As noted already, there is reason to believe that the association between attachment and sensitivity becomes more robust with age. Currently, it is unclear which of these interpretations is the more accurate, although of course they are not mutually exclusive.

The second general class of explanations for the modest association between sensitivity and attachment could be termed the 'domain gap' (Belsky & Fearon,

2008). What is intended here is consideration of ways in which novel aspects of parental behavior, partially but not fully overlapping with the sensitivity construct, might more closely match the causal inputs to the development of security and insecurity and therefore reveal stronger concurrent or predictive associations in observational studies. Although one could imagine a potentially wide ranging search for such candidates, there has been particular interest in recent years in operationalizations of sensitivity related to the parent's tendency to imagine and make sense of their child's mental states, such as their thoughts, feelings, or desires. For example, Slade and colleagues (Slade, Grienenberger, Bernbach, Levy, & Locker, 2005) found that parental reflective functioning as coded from verbatim transcripts of the Parent Development Interview at 10 months predicted 14-month attachment security, as well as the mother's parenting (Kelly, Grienenberger, & Slade, 2005). Focusing on a related construct in two separate studies, Oppenheim, Koren-Karie and colleagues found maternal insightfulness (e.g., the sophistication of thinking regarding the child's thoughts and feelings, the degree of insight into the child's motives) to predict the infant's later attachment security (Koren-Karie, Oppenheim, Dolev, Sher, & Etzion-Carasso, 2002; Oppenheim, Koren-Karie, & Sagi, 2001). Meins and colleagues have conducted perhaps the most comprehensive series of studies on the role of parental 'mind-mindedness' and attachment, by coding spontaneous mind-related statements that parents make during their interactions. Four separate studies (Laranjo, Bernier, & Meins, 2008; Lundy, 2003; Meins et al., 2012; Meins, Fernyhough, Fradley, & Tuckey, 2001) have found maternal mind-mindedness to be predictive of attachment security. In all four of these studies, the typical effects sizes were consistently and substantially higher than the meta-analytic average reported in De Wolff & van IJzendoorn's original article (Laranjo et al: r = .41;

Lundy: r = .58 and .60 for mothers and fathers respectively; Meins et al., 2001: r = .45; Meins et al., 2012: approx., r = .54), although such work was of course based on smaller sample sizes.

These studies are promising in pointing towards domains of parental care that may more robustly predict infant attachment security. However, by focusing on patterns of speech (during interactions or during semi-structured interviews) these studies beg the question of the immediate, proximal, behavioral mediators. Rather than consider these studies as describing a novel domain of parenting—conceptualised at the same level of analysis as sensitivity—it is arguably more appropriate to consider them as social-cognitive processes residing in the parent, whose behavioral correlates, as they affect attachment, remain to be determined.

A third explanation of the modest association between attachment and sensitivity is that the connection is moderated by other third variables (the 'moderator gap', Belsky & Fearon, 2008). Some examples of course were already discussed in the context of the De Wolff and van IJzendoorn meta-analysis. In that meta-analysis, evidence emerged that sensitivity may be more strongly associated with attachment in middle-class samples (r = .28) than in lower SES samples (r = .15), a finding echoed in at least one more recent study (Meins et al., 2012). As noted already, genetic factors have been suggested as possible moderators of the association between sensitivity and attachment, but the robustness of these findings may be limited (Luijk et al., 2011). A recent study nevertheless found some evidence in a relatively large sample that the sensitivity–attachment association may be moderated by genetic variability in the mineralocorticoid receptor gene (Luijk et al., 2011). Furthermore, there is reason to believe that sensitivity-focused interventions may be more successful in enhancing security for temperamentally reactive infants (see especially

Cassidy, Woodhouse, Sherman, Stupica, & Lejuez, 2011), but whether the same is true in typical development is currently unclear. We referred to another example of moderation previously, in the study by Atkinson et al., (2005), but in this case the moderation was by sensitivity itself: high-levels of sensitivity (presumably arising for reasons partially unrelated to parental security) attenuated the association between insecure parental attachment status and the security of the parent-infant attachment relationship.

The clearest example of a domain gap arises in the context of disorganized attachment, where studies have consistently revealed a weak association with traditionally conceived sensitivity (meta-analytic average, r = .10, van IJzendoorn, Schuengel, & Bakermans-Kranenburg, 1999). There is quite consistent evidence that disorganized attachment is markedly more common among infants and children who have experienced maltreatment (Cyr, Euser, Bakermans-Kranenburg, & van IJzendoorn, 2010; van IJzendoorn, et al., 1999). However, research just as clearly shows that other factors also play a role in disorganized attachment, particularly anomalous patterns of parental care. The evidence implicating anomalous parental behavior in disorganization is relatively clear, with the basic association having been found consistently in at least 10 independent studies (Abrams, Rifkin, & Hesse, 2006; Goldberg, Benoit, Blokland, & Madigan, 2003; Jacobvitz, Leon, & Hazen, 2006; Kelly, et al., 2005; Lyons-Ruth, Bronfman, & Parsons, 1999; Madigan, Benoit, & Boucher, 2011; Madigan, Moran, & Pederson, 2006; Schuengel, Bakermans-Kranenburg, & van IJzendoorn, 1999; Tomlinson, Cooper, & Murray, 2005; True, Pisani, & Oumar, 2001). A meta-analytic review of the evidence published in 2006 (Madigan et al., 2006) found the overall association between anomalous parental behavior and disorganized attachment to be equivalent to a correlation of r = .34. It is

worth bearing in the mind that while the original theorizing regarding disorganized attachment focused on fear, and particularly parental frightening or frightened behavior (FR), the broader term ‘anomalous parenting’ includes a variety of disturbances in the affective qualities of parental behavior beyond the FR construct, including parental dissociative behavior, disturbances in affective communication, role-reversal, and more broadly defined extreme insensitivity (see Out, Bakermans-Kranenburg, & van IJzendoorn, 2009). Thus far, few studies have been conducted that have simultaneously measured all of these in order to determine their relative importance or to test whether they are independently predictive of disorganization. In one recent study, Out and colleagues (2009) found that only the constellation of parenting behaviors falling under the category of frightened, frightening or dissociative behavior was predictive of disorganization and not extreme insensitivity (e.g., harsh, highly intrusive parenting). This finding is broadly consistent with a tendency for dissociative behavior to be the numerically stronger predictor of disorganization in some studies (e.g., Abrams, et al., 2006; Madigan, Moran, et al., 2006; Schuengel, et al., 1999). In addition to anomalous parental behavior it is also notable that a recent study found that parental mind-mindedness, particularly non-attuned mind-related comments, was quite strongly predictive of attachment disorganization (Meins, et al., 2012).

There is thus rather strong evidence regarding the primary determinants of disorganized attachment, although the causal status of the association between disorganization and anomalous parental behavior cannot be inferred from these data alone. Reasons to be optimistic that the association might be a causal one are provided by results of a longitudinal study by Forbes and colleagues (Forbes, Evans, Moran, & Pederson, 2007), which examined cross-lagged associations between anomalous

parental behavior and disorganization from 12 to 24 months. The critical finding in this investigation was that earlier anomalous parental behavior predicted subsequent disorganization, even after prior disorganization was statistically controlled for. However, causal status is most powerfully tested using experimental studies. Thus far, intervention studies have shown that rates of disorganized can be improved through therapeutic intervention (as we review below), but whether the mechanisms of action involve changes in parental frightening, frightened and dissociative behavior remains to be definitively established.

Genes, environments and temperament

Attachment theory provides a clear and coherent model of the mechanisms by which variations in the quality of parental care influence the child's attachment organization, and subsequently biases the child's socio-emotional development in systematic ways. In light of the findings of contemporary behavioral genetics research, which has documented strong and pervasive genetic influences on emotion, personality and cognition right across the lifespan (Plomin, DeFries, Knopik, & Neiderhiser, 2013), attachment theory makes rather bold predictions about the environmental causation of individual differences in attachment security and insecurity (O'Connor, Croft, & Steele, 2000).

Questions about the environmental or genetic causes of attachment security and insecurity originally centred on the role of temperament (for a review, see Vaughn, Bost, & van IJzendoorn, 2008). In particular, temperament researchers argued that differences in secure-base behaviour observed in the strange situation are in fact constitutionally-based differences in proneness to distress. Associations with maternal sensitivity, according to this view, simply represent the non-causal parental correlates of infant temperament (e.g., Calkins & Fox, 1992). Goldsmith and Alansky

(1987) carried out an early meta-analysis of 18 studies that had assessed infant temperament and infant-parent attachment and found that temperament predicted resistant behaviour in the Strange Situation. However, the effect size was small and no association was found for overall attachment classification. Hints of associations between attachment and measures of temperament have come and gone in more recent research. For example, Kagan (1994) subsequently found resistant infants to be over-represented in groups of infants who showed high levels of behavioural inhibition in early infancy. In Van den Boom's study (van den Boom, 1990; 1994), highly irritable infants were more likely to be classified as avoidant at 12 months than less irritable infants. Belsky (1996) on the other hand reported that only one association out of eight comparisons showed a relationship between temperament and attachment with father and none for attachment with mother. Mangesldorf et al. (Mangelsdorf, Gunnar, Kestenbaum, Lang, & Andreas, 1990) found no direct links with temperament but one out of four possible interactions between temperament and maternal personality. Difficult infant temperament, in conjunction with high maternal constraint, seemed to lead to insecure infant-mother attachment at 12 months. In fact there is some suggestion that difficult temperament may represent a risk factor for the development of insecure attachments. Crockenberg (1981), for example, found that temperament was associated with attachment classification only in the context of low maternal social support. The data regarding temperamental influences on attachment are certainly mixed. The interpretation of any associations, however qualified or moderated, also needs to be tempered by a recognition that temperament itself is influenced by both genetic and environmental factors, and hence cannot be straightforwardly attributed to endogenous causes (van IJzendoorn & Bakermans-Kranenburg, 2012).

Thus, broadly speaking, the debate regarding the role of temperament led to an accumulation of evidence that quite clearly underscored the rather distinctive nature of attachment, and the limited associations between attachment and temperament. However, such studies do not directly address the question of genetic or environmental causes of variation in security and insecurity. Only behavioral-genetic studies are capable of doing so. The first twin study of attachment using a standardized assessment tool was conducted by O'Connor and Croft (2001). This study used the Cassidy and Marvin (Cassidy, et al., 1992) modified Strange Situation Procedure in 125 3.5 year-old twin pairs, and found substantial correspondence between twins in attachment security (67% for security). When twin similarity was assessed separately for monozygotic (MZ; identical) and dizygotic (DZ; fraternal) twins using a continuous measure of security, the correlation was .48 for MZ twins, and .38 for DZ twins. Quantitative genetic analysis of these patterns of twin-twin similarity led to estimates of 32% for the shared environment, 53% for the non-shared environment 53%, and 14% for genetic influences. In the latter case, the genetic effect was not significantly different to zero. Given the more limited validation (in relative terms) of the preschool attachment assessment compared to what in some respects might be considered the 'gold standard' attachment assessment (12-month Strange Situation), as well as the modest sample size, these findings, while highly consistent with attachment theory, were open to question, and certainly required replication.

Bokhorst and colleagues (Bokhorst et al., 2003) conducted a somewhat larger twin study (N = 157 twin pairs) using the standard 12-month Strange Situation in two parallel groups seen in labs in Leiden and London. Overall similarity between twins for attachment security was 56% for MZ twins and 60% for DZ twins. Quantitative genetic modelling estimated that 52% of the variance was attributable to the shared

environment and 48% to the non-shared environment (plus measurement error), leaving the estimate of heritability at zero. The findings were thus quite consistent with O'Connor and Croft's study (2001), but indicated even more strongly the role of the environment, and particularly the shared environment. Subsequently, a third twin study was completed by Roisman and Fraley (2008), using a modified version of the Attachment Q-sort (conducted in the home) in a substantially larger sample of twins aged 2 years (485 twin pairs). The heritability estimate of the continuous security score from the modified AQS was .17 and non-significant. The shared environment, by contrast, was estimated to account for 53% of the variance in security, and 36% was attributable to non-shared environment and measurement error.

Despite the differing ages and methodologies, the three studies are remarkably consistent in documenting strong evidence of the primacy of environmental influences in the development of individual differences in attachment security, and collectively reflect a rather resounding confirmation of a key assumption of attachment theory. It is important to also note that the levels of twin correspondence in these studies converges remarkably well with studies of non-twin siblings (Teti & Ablard, 1989; van IJzendoorn et al., 2000; Ward, Vaughn, & Robb, 1988), which goes some considerable way to addressing concerns that the twin design might in some way lack validity or generalizability in this context. Furthermore, each of these studies used rigorous observational measures with strict blindness protocols, so that coders knew nothing about the co-twin's attachment security or twin zygosity.

Of course, attachment theory also makes specific predictions regarding the nature of the environmental influences on attachment security, and so to be fully consistent with theory the environmental influences on attachment security, particularly the shared environmental influences, should be traceable to variation in

the sensitivity of care. This key corollary of the theory was first examined by Fearon and colleagues (Fearon et al., 2006). Using the same twin sample referred to above, Fearon et al. (2006) coded home observations of maternal sensitivity obtained at 10 months, and related these to infant attachment security in the Strange Situation at 12 months. Maternal sensitivity in this study was found to be highly consistent between twins regardless of their zygosity, indicating sensitivity to be a highly shared environmental variable. As predicted, when the shared environmental variance in sensitivity was isolated from the non-shared variance (there was no genetic variance in sensitivity), it correlated significantly with the shared environmental component of attachment security. In other words, a significant portion of the shared environmental influences on attachment was attributable to similarities in how sensitive, or insensitive, mothers were to both of their infants. Roisman and Fraley (2008) subsequently replicated this finding using home observations of parenting from the Early Childhood Longitudinal Study-Birth cohort.

Behavioural genetic methods have proved to be key tools for testing the critical environmental hypotheses of attachment theory, and have produced remarkably consistent, and cumulatively persuasive, evidence that these basic assumptions are robust. Several further issues regarding the etiology of attachment warrant consideration. First, as indicated above, the non-shared environment includes measurement error, which is likely to be quite significant for assessments of attachment, and hence estimates of the shared environment are almost certainly *underestimates*. Second, standard genetic modelling of twin data does not take account of gene-environment interaction. When ignored, gene × shared environment interactions are estimated as genetic effects in the twin design, and gene × non-shared environment interactions are estimated as non-shared variance (Johnson, 2010). This

is important for two reasons. First, although genetic effects (e.g., observed in other domains of behaviour) could, and probably do, mask gene-by-shared environment interactions, shared environmental influences, such as those observed to influence attachment, represent 'pure' environmental effects. Second, in the only study that attempted to estimate the heritability of disorganized attachment (Bokhorst et al., 2003), marked evidence of non-shared environmental influence was found. Although this could be taken to indicate twin or sibling-specific environmental influences (such as parental differential treatment), it could also reflect interactions between genes and the non-shared environment. When these considerations are set alongside the fact that very limited numbers of disorganized cases have been subjected to quantitative genetic analysis, it is appropriate to conclude that uncertainty still remains about the genetic and environmental influences on disorganized attachment.

This latter caveat takes on particular significance in light of the fact that some studies have reported associations between disorganized attachment and directly measured genetic polymorphisms. The first of these was conducted by Lakatos and colleagues (Lakatos et al., 2000), who, in a community sample of 90 infants, examined the association between disorganized attachment and a polymorphism of the dopamine D4 receptor gene. Of 17 infants classified as disorganized, 12 (71%) had a variant of this gene containing 7 or more repeats of a 48 base pair sequence in the third coding region of the gene, which is thought to alter dopamine signalling. A follow up paper (Lakatos et al., 2002) reported that a single nucleotide polymorphism in the promoter region of the same gene (a C>T substitution) amplified the effect of the DRD4 gene on disorganization. Neither of these genes, nor their interaction, was found to relate to attachment disorganization in two independent samples studied by Bakermans-Kranenburg and van IJzendoorn (Bakermans- Kranenburg & van

IJzendoorn, 2004; van IJzendoorn & Bakermans-Kranenburg, 2006). Numerous studies followed also attempting to replicate the association, but none of them did so (see Bakermans-Kranenburg & van IJzendoorn, 2007; Frigerio et al., 2009; Luijk, et al., 2011; Gottfried Spangler, Johann, Ronai, & Zimmermann, 2009). A meta-analytic average of available samples in 2007, including the Lakatos sample, was d = .05 (r = .02), p = .66, N = 542 (Bakermans-Kranenburg & van IJzendoorn, 2007). In the largest replication study, which combined two relatively large cohort studies from the US and the Netherlands (Luijk, et al., 2011), involving 478 and 543 participants respectively, the associations between the DRD4 7+ VNTR and attachment disorganization were non-significant r = .03 and r = .04. The conclusion is unavoidable that the evidence does not indicate that the DRD4 polymorphism is involved in the development of attachment disorganization. Having said that, as we elaborate below, contemporary genetics is strongly pointing to the fact that main effects of single genes, where they exist, are typically of extremely small magnitude, and hence that past studies have lacked power by several orders of magnitude. It is therefore conceivable that single genes, such as the DRD4, might play a very small role in disorganized attachment but we have so far lacked power to detect them reliably. Nevertheless, the current evidence does not lend support to the DRD4 gene being a more promising gene candidate than polymorphisms in any other region of the genome.

Another line of work that has emerged in this area is the investigation of gene-by-environment interactions. For example, evidence of gene-by-environment interaction was found by Bakermans-Kranenburg and Van IJzendoorn (2006) in a sample of 85 mothers who were selected on the basis of having experienced an important loss. These authors found that the DRD4 gene interacted with maternal

unresolved loss, as assessed using the Adult Attachment Interview. Infants that had the 7+ allele of the DRD4 gene and whose mothers were unresolved with respect to loss were more likely to be disorganized. Put another way, it appeared that the effect of maternal unresolved loss was stronger for infants with the DRD4 7+ allele. Or, put the other way around, the findings indicated that carriers of the 7+ repeat were the least disorganized when their mothers were not unresolved, and in that sense this study was an early example of evidence indicating genetic "differential susceptibility" (Bakermans-Kranenburg & van IJzendoorn, 2007). Spangler and colleagues (2009) found no DRD4-by-parental care interactions in relation to attachment disorganization in a sample of 106 infants from the Regensburg longitudinal study. They did however find a GxE effect of parental care on disorganization in relation to a different gene—the 5HTTLPR polymorphism of the serotonin transporter gene (with the short form being associated with disorganized attachment, but only when parental responsiveness was low). Notably, Barry, Kochanska and Philibert (N = 88, Barry, Kochanska, & Philibert, 2008)) found the short form of the 5HTTLPR gene to be associated with attachment *insecurity* overall (they did not report effects specifically on disorganization), and that the short-form predicted insecurity more strongly (indeed, only) when maternal responsiveness was low. The form of this effect, though not the precise nature of the outcome (insecurity, rather than disorganization) mirrors that found by Spangler and colleagues quite closely. However, a recent report by Raby and colleagues (Raby et al., 2012) failed to replicate this 5HTTLPR × parental responsiveness interaction.

The picture concerning gene environment interactions in the development of disorganized (or indeed insecure) attachment is thus quite mixed, and currently it is unclear whether replicable associations exist. The recent, larger scale investigation by

Luijk and colleagues (Luijk, et al., 2011) favors the view that gene-environment interactions, in addition to the genetic main effects referred to earlier, may not be reliable. In both US and Dutch samples, data were available on several other genes in addition to DRD4 (5HTTLPR, DRD2, COMT, OXTR) and on observed maternal sensitivity. After taking account of multiple hypothesis testing, no reliable genetic main effects, or gene x sensitivity interactions were apparent in relation to security or disorganization. However, although this is the most statistically powerful test of molecular genetic main effects and interactions conducted thus far, it did not involve measures of the most promising candidate environmental factor with respect to disorganization: parental anomalous, or frightening/frightened parenting. We await large-scale tests of such GxE predictions.

Broadly speaking then, the extant work on the molecular genetics of attachment in infancy, in contrast to the behavior genetic studies, is marked by inconsistency and failures to replicate. Overall, the net implication of both the twin and candidate gene studies is that, in keeping with the predictions of attachment theory, attachment in early life is strongly influenced by the environment and shows little evidence of being determined by genes.

Should we therefore conclude that further genetic research is not warranted? In our view, this would be a premature conclusion to draw. Some useful lessons can be drawn from the larger field of psychiatric genetics. As Kendler (2013) notes, quantitative behavioral genetics convincingly demonstrated that all major forms of psychiatric disorder show marked genetic influence, but early studies selecting candidate genes involved in neurotransmitter function (the so-called "usual suspects" in candidate gene studies, see Ebstein, Israel, Chew, Zhong, & Knafo, 2010) largely failed to find replicable associations. As larger-scale studies emerged, and

researchers increasingly recognized the importance of several methodological issues (particularly the need for strict controls on type I error), initial findings tended not to be replicated. Genome-wide association studies (GWAS), which genotype very large numbers of polymorphisms (often > 500,000 single nucleotide polymorphisms [SNPs]), came to subsequently dominate the field, with an emphasis on blind identification of genes without any prior selection based on biological 'plausibility'. Initially, these studies, which required very large samples, also failed to find replicable effects. However, with even larger samples (often *N*s greater than 20,000) what has emerged is quite clear evidence of replicable gene associations for several major conditions (e.g., schizophrenia, bipolar disorder, see Kendler, 2013). Thus, GWAS appear to indicate quite convincingly that the majority of genes associated with liability to psychiatric disorder have reliable but extremely small main effects, and require very large samples to detect. Secondly, GWAS studies tend to suggest that the replicable genetic associations are not those that would have been chosen on the basis of, in hindsight, a perhaps simple-minded model of psychiatric disorder. Instead, replicable associations for several psychiatric disorders have involved genes with diverse and largely unanticipated functions, such as inflammatory processes, calcium channel signalling, cell adhesion and myelination. The meaningfulness of these findings is supported not only by the statistical data, but also by the fact that the identified genes are consistently found to be expressed in the brain and that a substantial proportion of the heritability of psychiatric conditions can be "recovered" from an analysis of variability in common SNPs across the genome (Kendler, 2013).

In light of the fact that, unlike most psychiatric disorders, the overall heritability of attachment security appears low (at least in infancy/toddlerhood), it seems fair to say that the search for genetic main effects on attachment faces

considerable hurdles. However, GWAS studies, for the most part, focus on genetic main effects. Somewhat stronger effects have been found for studies of candidate gene × environment interactions, although even here the picture is complex. Arguably the most promising gene-environment interaction – the interaction between the short form of the 5HTTLPR gene and life stress in determining depression (Caspi et al., 2003), has been fraught with non-replications, and remains controversial to this day. For example, meta-analytic studies have drawn widely divergent conclusions regarding the reliability of the effect, in part as a result of their differing inclusion criteria (Uher & McGuffin, 2010). The most recent meta-analysis by Karg et al. (Karg, Burmeister, Shedden, & Sen, 2011) did however find strong overall evidence of G×E interaction in depression, based on over 40, 000 individuals, but the results were notably more robust for childhood maltreatment than for life stress/life events. A review by Uher and McGuffin (2010) concluded that the evidence in favour of G×E in depression is quite strong, and that the quality of environmental measures is a key determining factor in the strength and reliability of findings. In particular, objective measures of the environment produced more clear-cut evidence of interaction than subjective self-reports. Thus, we may conclude that gene-environment interaction studies hold more promise for understanding the development of attachment than studies of genetic main effects, but that high-quality measures of the environment, and of the phenotype, and large-scale epidemiologically rigorous samples will likely be necessary to detect them. More, and larger scale, quantitative genetic studies (e.g. twin and adoption studies) are also needed to guide molecular genetic studies to the most promising aspects of attachment (i.e. those with the highest heritability) and to the right environmental moderators.

Thus far, we have only addressed the genetic and environmental determinants of attachment in the first three years of life, but of course attachment is considered an important aspect of human functioning across the lifespan. Given the modest stability in measures of attachment over time (see below), it is not appropriate to assume that the genetic and environmental determinants of childhood, adolescent or adult attachment are the same as those that obtain in infancy or toddlerhood. Furthermore, it is important to note that to the extent that behaviour genetic studies have found evidence of shared environmental effects on other aspects of development, this has tended to be early in the lifespan (infants and pre-schoolers). The shared environment may thus represent a set of causal influences that are more dominant in early life and that may diminish with time (Plomin, et al., 2013). Another important consideration is that attachment status in childhood, adolescence, and adulthood is measured and conceptualized very differently to the separation-reunion or secure base tools used in the early years, a difference that may alter the balance of genetic and environmental determinants one observes. Indeed, Main (Main, 1996) argued that the ability to reflect upon and integrate what might be difficult early experiences, which is central to adult/adolescence measures of attachment, may place greater weight on individual characteristics that are partly heritable (Main, 1996).

Several studies have examined the role of genes and environments in attachment styles (as indicated by self-reports, such as the Experiences in Close Relationships Scale, Fraley, Waller, & Brennan, 2000) in adults. In a sample of 239 adult twin pairs, Brussoni and colleagues (Brussoni, Jang, Livesley, & MacBeth, 2000) estimated that 37% of the variance in attachment anxiety was due to genetic differences and 60% to non-shared environment. Attachment avoidance on the other hand was not heritable, and 29% of the variance was attributable to shared

environment. These results were replicated by Crawford and colleagues (Crawford et al., 2007), finding 40% heritability for attachment anxiety and no genetic influence on avoidance. However, Picardi and colleagues (Picardi, Fagnani, Nistico, & Stazi, 2011), using a relatively large sample of young adult twins (n = 677 twin pairs), replicated the findings for attachment anxiety (45% heritability; 55% non-shared environment), but not those for avoidance (finding 36% heritability, and 64% non-shared environment). In a recent large-scale study of middle age men, Franz et al. (2011) found that genetic differences accounted for 38% of the variance in attachment anxiety and 27% of the variance in attachment avoidance. Notably, they found that the genes involved in attachment anxiety and avoidance only partly overlapped and that attachment avoidance in particular showed distinct genetic influences that were independent of measures of depression and personality (see also Donnellan, Burt, Levendosky, & Klump, 2008). There is thus highly consistent evidence that self-reported attachment anxiety is influenced by genetic factors, and larger twin studies also tend to indicate genetic influence on attachment avoidance. Inconsistencies between studies may also reflect the different measures used, as the two studies that found shared environmental effects on avoidance used the Relationship Scales Questionnaire (Griffin & Bartholomew, 1994), while those that did not used the ECR or the Adult Attachment Scale (Collins & Read, 1990).

These findings provide a partial picture of the genetic and environmental determinants of attachment in adulthood, as measured using self-reports. However, one cannot infer from this the pattern of heritability of attachment as measured using representational/interview measures, because numerous studies show these two measurement approaches to be essentially orthogonal (Roisman et al., 2007). Recent studies with adult or adolescent siblings using the AAI provide some useful data in

that regard. Two independent studies have found effectively no correspondence between siblings in their overall security of attachment as assessed in the AAI (Fortuna, Roisman, Haydon, Groh, & Holland, 2011; Kiang & Furman, 2007). Although these data do not bear directly on the role of genes, they do suggest that the shared environment may not play as strong a role in adult attachment as that observed in infants (cf. van IJzendoorn, et al., 2000). Currently, the strongest available direct evidence regarding the role of genes and environments in representational measures of attachment comes from a recent relatively large-scale twin study by Fearon and colleagues (Fearon, Shmueli-Goetz, Viding, Fonagy, & Plomin, 2013). Fearon et al. used the Child Attachment Interview (Shmueli-Goetz, Target, Fonagy, & Datta, 2008) to study the attachment representations of 551 adolescent twin pairs (aged 15 years), drawn from the Twins Early Development birth cohort study (TEDS, see Trouton, Spinath, & Plomin, 2002). The results differed quite dramatically from the findings of the earlier twin studies of infant/toddler attachment. First, no evidence of shared environmental influence was found; DZ twins, much like the siblings described above, showed no significant correspondence in their attachment classifications, and only weak correlations for the continuous security scale (r = .20, N = 261 twin pairs). Second, strong evidence of genetic effects emerged. In contrast to the DZ twins, MZ twins showed marked resemblance for security and coherence, with the correlation between twins for coherence being double that observed for DZ twins (r = .40). Standard genetic analysis showed that after controlling for gender and age, 38% of the variance in coherence and 35% of the variance in binary security was attributable to genetic factors. The remaining variance was attributable to the non-shared environment and measurement error. When one considers that measurement error attenuates the genetic effect, these heritability figures are likely to be underestimates.

The same considerations of course would caution against ruling out a modest shared environmental effect, as attenutation could have occurred to such a degree that it could not be reliably detected in this sample.

These findings are striking in their marked contrast to those identified in very young children. We cannot at this stage ascertain whether they reflect a distinct feature of the adolescent period (where we know normative increases in dismissing speech can be observed, see Bakermans-Kranenburg & van IJzendoorn, 2009; Waters, Weinfield, & Hamilton, 2000; Weinfield, Sroufe, & Egeland, 2000), or are reflective of a broader unfolding process of developmental change taking place beyond that. They certainly draw attention to the possibility that the genetic and environmental determinants of attachment may not be constant across development, and raise the possibility that genes may begin to shape the organization of attachment, at least at the representational level, in adolescence, and possibly beyond. If these findings prove to be correct, a key question to be addressed by future research is how such changes in the genetic profile of attachment between infancy and adolescence come about. We can imagine mechanisms operating at two distinct levels: it may be that these genetic effects occur via gene-environment environmental interplay, such that heritable traits in the child begin to affect parent-child interactions (e.g., evoking hostility/negativity, see Avinun & Knafo, 2013; Narusyte et al., 2008), which in turn impact on the adolescent's attachment organization. Such a mechanism is an example of *gene-environment correlation*. Another possibility is that these effects arise at the level of the individual's response to attachment-related experiences. For example, genetically-influenced traits may affect adolescents' emotion-regulation skills, bias their interpretations of attachment experiences or influence their ability to integrate them coherently within an internal working model. All of these processes might feed

into adolescents' states of mind with respect to attachment as they shift with time developmentally. It would be wrong of course to emphasize only the genetic findings regarding adolescent attachment. In keeping with studies of infants and toddlers, attachment in adolescence clearly demonstrates marked non-shared environmental influence and these findings compel the field to investigate the environmental mechanisms leading to differences in security between children raised in the same family. Finally, we note that an urgent research question is whether genetic influences also characterize attachment into adulthood as assessed in the Adult Attachment Interview. In that context, there is of course already existing evidence that representational assessments of adult attachment are associated with earlier caregiving experiences (e.g., Beijersbergen, Juffer, Bakermans-Kranenburg, & van IJzendoorn, 2012). Furthermore, even were one to find genetic influences on adult attachment, this would not necessarily imply that the inter-generational transmission of attachment from parent to child is mediated by genes (D'Onofrio et al., 2007). In that regard, evidence of intergenerational continuity from parent to child among children in foster care (Dozier, Stovall, Albus, & Bates, 2001), where caregivers and their children are not biologically related, would seem to indicate environmental transmission.

Continuity and Change in Attachment Security across the Life Course

The nature of internal working models contributes to an implicit assumption in attachment theory that individual differences in attachment security are relatively stable over time. To be sure, according to attachment theory (Bowlby, 1969), relative stability in internal working models is thought to be ensured through the increasing automatization of parent-child interactions, ultimately decreasing attentional demands and conscious revision of working models. Such habitual interaction patterns also

lead to negative or positive perceptual biases that color expectations and interpretations of subsequent experiences. Moreover, because both the caregiver and child hold working models of the relationship, if one partner attempts to change routinized relationship patterns, the other is likely to resist and attempt to maintain the established pattern. Bowlby also acknowledged, however, that updates to internal working models are expected under certain environmental conditions, including changes in parent-child relationship quality and/or changes in life circumstances that improve or undermine the caregiver's perceived or actual ability to sensitively respond to the child's attachment needs. Thus, although attachment security is expected to remain relatively stable across the life course, it is also recognized that lawful change in security is possible given attachment-relevant changes in life circumstances (see Bretherton & Munholland, 2008).

Questions concerning stability and lawful change in attachment security have garnered a great deal of interest and have been the focus of much empirical inquiry. Initial investigations in this area focused on short-term stability in the organization of attachment behavior during childhood. In the first investigation of this kind, Waters (1978) provided evidence for remarkably strong stability in infants' organized attachment patterns in relation to their mother as measured by the Strange Situation from 12 to 18 months (see also Goossens, van IJzendoorn, Tavecchio, & Kroonenberg, 1986). However, subsequent investigations of the stability of mother-child attachment security from the Strange Situation to another standardized observational assessment of attachment during early childhood (e.g., Strange Situation, AQS, modified Strange Situation) provided mixed evidence. Although some studies found significant stability (Howes & Hamilton, 1992; Main, et al., 1985; Main & Weston, 1981; Owen, Easterbrooks, Chase-Lansdale, & Goldberg, 1984;

Vaughn, Egeland, Sroufe, & Waters, 1979; Wartner, et al., 1994), others did not (Belsky, Campbell, Cohn, & Moore, 1996; Egeland & Farber, 1984; Thompson, Lamb, & Estes, 1982).

An understandably more challenging question to address concerns the stability of attachment security from infancy to adulthood, as empirically addressing such questions necessarily requires prospective, longitudinal data (for an overview of such studies, see Grossmann, Grossmann, & Waters, 2005; Roisman & Haydon, 2011). As such, evidence regarding stability and change in attachment security from infancy into the years of maturity emerged only relatively recently, dating to 2000 when a handful of studies were published simultaneously in the journal of *Child Development* (Hamilton, 2000; Lewis, Feiring, & Rosenthal, 2000; Weinfield, et al., 2000). As with the literature on short-term stability in attachment security, the extant longitudinal studies have provided mixed evidence, with some studies finding stability in attachment security from infancy, as assessed with the mother in the Strange Situation, to adulthood, as assessed with the AAI (e.g., Hamilton, 2000; Main, 2000, 2001; Main, Hesse, & Kaplan, 2005; Waters, Merrick, Treboux, Crowell, & Albersheim, 2000), and other not (Beijersbergen, et al., 2012; Lewis, et al., 2000; Weinfield, et al., 2000; Zimmermann, Fremmer-Bombik, Spangler, & Grossmann, 1997).

Although the apparent discrepancy among these findings regarding attachment stability across the life course can be explained in a number of ways, one interpretation that has emerged in the literature in light of evidence that studies focused on middle-class, relatively low-risk families have generally provided evidence for stability in attachment security (e.g. Main, et al., 2005; E. Waters, 1978) and studies focused on at-risk samples have not (e.g., Egeland & Farber, 1984;

Weinfield, et al., 2000) is that attachment security is generally stable, except in populations that are at higher risk for experiencing life stress and, thus, more profound changes in the caregiving environment (e.g., Waters, Weinfield, et al., 2000). In order to test such claims and provide a more accurate estimate of the stability of attachment security across the early life course, Fraley (2002) conducted a meta-analysis of this literature, specifically including studies that reported on the association between attachment security as assessed by the Strange Situation and another behavioral measure of attachment (Strange Situation, AQS, modified Strange Situation) or the AAI. Findings from this meta-analysis provided evidence that attachment security is moderately stable from infancy to adulthood ($r[\Phi] = .39$), and consistent with prior conclusions, attachment security was found to be less stable in samples considered to be at higher risk ($r = .27$) than those at lower risk ($r = .48$).

Pinquart, Feuβner, and Ahnert (2013) provided an update of this effort in light of more recently published work in their meta-analysis on the stability of attachment security. Similar to Fraley's (2002) findings, Pinquart and his colleagues (2013) provided evidence for moderate stability in attachment security across early childhood (*r*'s range from .24 - .46 depending on the time interval between assessments) and that the effect was significantly weaker in at-risk samples ($r = .21$) than in not at-risk samples ($r = .36$). In contrast to findings from Fraley (2002), however, Pinquart and colleagues (2013) found that attachment security was not significantly stable from infancy to adulthood ($r = .14$). Unfortunately, because Pinquart and colleagues (2013) included a range of adult attachment assessments, whereas Fraley (2002) focused on studies employing the AAI as the assessment of adult attachment, it is difficult to determine whether this discrepancy is due to the emergence of new evidence of the relative instability in attachment security published in the interim between Fraley's

(2002) and Pinquart et al.'s (2013) meta-analyses, or due to differences in the scope of the two meta-analyses.

It is even more important to note that, due to the small sample size of many of the investigations of attachment stability across the early life course, the total number of individuals studied from infancy to young adulthood in the extant literature is, by most standards, quite modest, resulting in a relatively limited corpus on which to estimate the stability of attachment security. In fact, only about 785 participants have been studied across all investigations to date (Roisman & Haydon, 2011). In the most recent wave of the NICHD Study of Early Child Care and Youth Development (SECCYD)—a longitudinal study following over 1,000 low-risk participants from infancy to adulthood and comprising several early observational assessments of mother-child attachment security (Strange Situation administered at 15 mo., AQS administered at 24 mo., modified Strange Situation administered at 36 mo.)—857 participants were administered the AAI at age 18, making it the largest, most comprehensive single investigation of the stability of attachment security to date. Helping to reconcile prior mixed evidence in the literature, findings from this study indicate that although attachment security is significantly stable over the early life course, the magnitude of such stability is quite weak by conventional standards ($r = .12$; Groh et al., in press).

As with prior investigations of attachment stability, caregiving and contextual sources of variation that might contribute to stability and lawful change in attachment security were also examined in the SECCYD (Booth-LaForce et al., in press). Prior investigations have identified several theoretically relevant aspects of the caregiving environment that might contribute to stability and change in attachment security (e.g., Beijersbergen, et al., 2012; Egeland & Farber, 1984; Frodi, Grolnick, & Bridges,

1985; Hamilton, 2000; Lewis, et al., 2000; Main, et al., 2005; NICHD Early Child Care Research Network, 2001, 2006; van Ryzin, Carlson, & Sroufe, 2011; Waters, Weinfield, et al., 2000; Weinfield, et al., 2000; Weinfield, Whaley, & Egeland, 2004). However, studies have varied in terms of the contextual factors investigated and findings across studies have not always converged, making it difficult to draw firm conclusions regarding whether instability in attachment security is lawful and which environmental factors contribute to positive and negative deflections from infancy to adulthood.

The large longitudinal SECCYD sample includes assessments over time of important potential sources of change and continuity in attachment security; thus, it is very well-positioned to address questions concerning environmental factors associated with stability and change in attachment. Consistent with expectations that internal working models are reinforced by stability in parent-child relationship quality over time, evidence from this study indicated that stability in attachment security (vs. insecurity) is associated with higher levels of maternal sensitivity, more paternal physical presence in the home, and lower levels of paternal psychopathology over the course of development from infancy to adulthood. Overall, findings from this investigation were also consistent with claims that instability in attachment-relevant variation across the early life course is lawful, in that change in attachment security can be explained by comparable changes in attachment-relevant life circumstances. Specifically, individuals who experienced high quality relationships in infancy but came to develop insecure attachment representations in adulthood experienced higher levels of paternal physical absence from the home, larger increases in negative life events, and larger declines in the quality of maternal sensitivity over the course of development. In contrast, individuals who overcame early insecurity and developed

secure attachment representations in adulthood were found to experience higher levels of maternal sensitivity over the early life course (Booth-LaForce, et al., in press).

Taken together, findings from across the literature on continuity and change in attachment security provide evidence that attachment security is not especially stable across the life course, but that when discontinuity exists, it can be explained by attachment-relevant changes in the caregiving environment. That said, several limitations of this literature should be noted and addressed in future research. The literature on attachment stability is largely a literature of *mother*-child attachment. Pinquart and colleagues (2013) have provided evidence in their meta-analysis that the stability of father-child attachment security (r = .27) is comparable to that of mother-child attachment security. However, such evidence is based on a relatively limited corpus of data. Indeed, only two studies based on relatively small samples have investigated the concordance between father-child attachment security in infancy and the security of attachment representations in adulthood (Steele & Steele, 2005; Zimmermann, et al., 1997). As it may be the case that attachment security with both the mother and father, rather than security with the mother alone, is more predictive of states of mind with respect to attachment in adulthood, there is a clear need for more comprehensive investigations of the stability of attachment security that include assessments of attachment with both mothers and fathers.

In addition, two diverging perspectives of attachment stability have emerged in the literature. According to what has been referred to as the *revisionist* perspective, working models are revised and updated in light of ongoing experiences, and thus, it is not necessarily expected that working models in adulthood will correspond with those developed in infancy. In contrast, according to the *prototype* perspective, while updating of working models in light of new experiences is acknowledged, it is also

argued that models developed in infancy remain unchanged and continue to anchor interpersonal experiences throughout the life course (see Fraley, 2002). Because evaluating such claims requires attachment security to be assessed repeatedly over developmental periods, longitudinal investigations of attachment stability that only include two assessments of attachment security, which is typical in the extant literature, are unable to distinguish between these two perspectives. Fraley (2002) meta-analytically evaluated the empirical support for such claims in light of available evidence at the time, providing evidence consistent with the prototype perspective. However, in light of evidence from Pinquart and colleagues' (2013) meta-analysis and findings from the SECCYD (Groh et al., 2013) of relatively weak stability in attachment security from infancy to adulthood, such claims might have to be re-evaluated in light of this more recent evidence.

Inherent in the study of attachment stability is the assumption that stability and lawful change in attachment security is environmentally mediated. However, nearly all studies on the stability of attachment security have relied on samples in which parents and children are genetically related (but see Beijersbergen et al., 2012), leaving open the possibility that stability and lawful change in attachment security might be attributed to the genetic relatedness between the parent and child. Initial evidence from a study of adopted children and their mothers that greater levels of maternal sensitivity in infancy and adolescence are associated with stability in attachment security and that positive changes in maternal sensitivity from infancy to adolescence are associated with positive deflections in attachment security (Beijersbergen et al., 2012) support an environmentally mediated pathway (although such findings could also be explained by gene-environment correlation). Given the centrality of this issue to attachment theory, future work should further employ

genetically-informed research designs (including studies of monozygotic and dizygotic twins) to thoroughly address issues concerning environmental or genetic mediation of stability and lawful change.

Finally, the literature on the stability of attachment security is predicated on the assumption that the key test of stability in security should involve the prediction from infant assessments of attachment security (e.g., Strange Situation) to adult assessments (e.g., AAI). Such a focus might be an error of emphasis for at least two reasons. First, given that Bowlby (1973) theorized that internal working models are only tolerably accurate representations of prior experiences, such a focus may be an overly conservative test of attachment stability. For example, when examining the contribution of adults' attachment-relevant experiences with caregivers over the course of childhood to their states of mind with respect to attachment as measured at age 18 with the AAI in the context of the SECCYD, 20% of the variance in dismissing states of mind and 11% of the variance in preoccupied states of mind in adulthood were accounted for by assessments of adults' prior experiences with mothers and fathers (Haydon, Roisman, Owen, Booth-LaForce, & Cox, in press). Second, there is a very clear need for studies that examine stability and change in security *within adolescence and adulthood* (see Allen, McElhaney, Kuperminc, & Jodl, 2004; Crowell, Treboux, & Waters, 2002), not incidentally a period of development when it is possible to use a common assessment of security over assessments.

Children's Attachment Security and Psychopathology

Bowlby was particularly interested in the developmental origins of children's emotional disturbance, and believed that early relational experiences were of great

importance in the ontogeny of mental health and illness. Yet, the majority of initial work on the developmental significance of individual differences in early attachment security primarily focused on children's normative development, and in particular on the contribution of early attachment relationships to subsequent interpersonal competence (Berlin, Cassidy, & Appleyard, 2008; Groh et al., under review; Schneider, Atkinson, & Tardif, 2001). However, as the field of developmental psychopathology took shape (see Cicchetti, 1984) and early attachment insecurity was further conceptualized as a risk factor for the development of behavioral problems (Sroufe, 1988), there was renewed interest in the significance of early parent-child attachment relationships for the development of psychopathology (see DeKlyen & Greenberg, 2008). In the past few decades, a sizable literature on the links between early attachment and psychopathology has emerged, establishing attachment theory as a dominant theoretical framework guiding research on the role of early experiences in the development of psychopathology. In this section, we provide an overview of this now vast literature and offer new insights in light of recent meta-analytic evidence (Fearon, Bakermans-Kranenburg, van IJzendoorn, Lapsley, & Roisman, 2010; Groh, Roisman, van IJzendoorn, Bakermans-Kranenburg, & Fearon, 2012; Madigan, Atkinson, Laurin, & Benoit, 2013). Following the focus of research in this area, we primarily discuss investigations of the links between early mother-child attachment security and externalizing (e.g., aggression) and internalizing (e.g., anxiety, depression) symptomatology.

A number of (non-mutually exclusive) mechanisms have been proposed to explain why early attachment experiences might be associated with psychopathology. The dominant explanation concerns the internal working models (IWM) construct (Bowlby, 1973, 1980; Bretherton & Munholland, 2008). As described previously in

this chapter, based on caregivers responsiveness to attachment signals, infants develop cognitive-affective representations, or IWMs, that encompass views of the caregiver as (un)responsive, and in turn, views of the self as (un)worthy of love and care that overtime become generalized into views of the self, others, and the nature of relationships. As a result of the care they receive, insecure infants are believed to develop IWMs characterized by anger, mistrust, anxiety, and/or fear, coloring their subsequent social experiences and ultimately heightening their risk for developing psychopathology, whereas secure children are believed to develop IWMs characterized by inner confidence, efficacy, and self-worth, helping to buffer them against developing mental illness.

Because both theory and research have established the importance of emotion regulation in the etiology and maintenance of internalizing and externalizing problems (Chaplin & Cole, 2005; Izard, Youngstrom, Fine, Mostow, & Trentacosta, 2006), another powerful explanatory framework concerns the contribution of early attachment relationships to children's developing capacity to tolerate and manage affect. More specifically, it has been argued that within the parent-child attachment relationship, children develop either adaptive (in the case of secure children) or maladaptive (in the case of insecure children) emotion regulation strategies (Cassidy, 1994; Isabella, 1993; Sroufe, 1979, 1996) that serve, respectively, as either protective or risk factors for later psychopathology (e.g., Carlson, 1998; Guttmann-Steinmetz & Crowell, 2006).

Another potential avenue through which early attachment experiences might contribute to the development of psychopathology occurs at the level of behavior. Through the history of care they receive, children develop specific behavioral strategies for interacting with their caregivers that might be considered adaptive

organizations of behavior given the constraints of the quality of caregiving the children have experienced. For example, on the assumption that resistant infants experience a history of inconsistently responsive care, it would be considered adaptive (at least in the narrow, proximal sense) to exaggerate attachment behavior in order to increase the likelihood that the caregiver will respond to the infant's needs (Simpson & Belsky, 2008). However, such behavioral strategies might be considered maladaptive *outside the context of the parent-child relationship*, placing insecure children at heightened risk for social exclusion and developing psychopathology (Greenberg, Speltz, & DeKlyen, 1993; Weinfield, Sroufe, Egeland, & Carlson, 2008). Other potential mechanisms that have been proposed to buffer secure children from the development of internalizing and externalizing symptoms include (a) developing sense of self-confidence stemming from experiences of support and comfort and through effective exploration of the environment (Goldberg, 1997), (b) generalized positive social expectations (e.g., Dodge & Coie, 1987), (c) socialization of moral emotions and values (Kochanska, 1997; van IJzendoorn, 1997), (d) continuity in ongoing supportive caregiving (Lamb, Thompson, Gardner, Charnov, & Estes, 1984), and (e) social regulation of biological systems mediating effective stress and arousal regulation (e.g., Suomi, 2003; Weaver et al., 2004).

Although Bowlby's ideas concerning the significance of children's early experiences with primary caregivers for subsequent developmental (mal)adaptation were highly influential, the development of the Strange Situation Procedure greatly facilitated the empirical investigation of the correlates and consequences of the quality of early parent-child attachment relationships. One of the earliest and most influential longitudinal studies of the developmental sequelae of early attachment variation was launched in Minnesota by Byron Egeland and Alan Sroufe (see Sroufe,

Egeland, Carlson, & Collins, 2005a). It was in the context of this landmark longitudinal study that the conceptual links between attachment and psychopathology were elaborated on, providing the field with more specific hypotheses regarding the legacy of early attachment experiences for the development of psychopathology.

Specifically, this relatively large, high-risk cohort has been followed for over 35 years beginning at birth, and results from extensive assessment of adaptive and maladaptive behavior have provided consistent evidence that individuals who developed an insecure attachment relationship with their mother in infancy are at heightened risk for developing psychopathology across the life course (Sroufe, et al., 2005a). Results have also revealed that specific types of attachment insecurity serve as distinct diatheses for the development of externalizing versus internalizing symptomatology, with insecure-avoidant infants found to be at heightened risk for developing aggression (believed to result from feelings of anger derived from early rejection by caregivers) and resistant infants found to be at heightened risk for developing anxiety (believed to result from feelings of worry derived from early inconsistent or unresponsive care; Sroufe, 2003). Such evidence has contributed to the hypothesis that early avoidance increases risk for developing externalizing symptoms, whereas early resistance increases risk for developing internalizing symptoms. In addition, with the discovery of attachment disorganization, it was further hypothesized that because disorganized infants show contradictory and fragmentary behaviors—indicative of a breakdown of an organized emotion regulation strategy in the face of stress—they might be at heightened risk for developing both internalizing and externalizing symptoms (Carlson, 1998).

A second hypothesis to emerge from the work at Minnesota is that early attachment experiences play an enduring, if probabilistic, role in shaping

developmental (mal)adaptation. Consistent with Bowlby's (1973) view that current adaptation is a function of both prior and current circumstances, Sroufe and his colleagues (Sroufe, Egeland, & Kreutzer, 1990) claimed that current experiences have the power to transform adaptation without erasing the history of prior adaptation. Thus, early attachment-relevant experiences are thought to contribute in enduring ways to adaptation across the life course.

Although consistent evidence from the Minnesota study has been presented in support of these hypotheses (Sroufe, et al., 2005a; Sroufe, Egeland, Carlson, & Collins, 2005b), other investigations have not always found a significant link between early attachment insecurity and disorganization and symptoms of psychopathology. Indeed, in the same monograph in which the first evidence was presented from the Minnesota study of a significant link between attachment insecurity and behavior problems (e.g., hostility, withdrawal; Erickson, Sroufe, & Egeland, 1985), evidence from another longitudinal study of 120 middle-class families was presented in which no association between individual differences in mother-child attachment security and behavioral problems was found (Bates, Maslin, & Frankel, 1985). This lack of consistent evidence across studies might be explained in a number of ways, but because investigations of middle-class, relatively low-risk families have tended to not find a main effect of attachment insecurity on psychopathology (e.g., Bates, et al., 1985; Fagot & Kavanagh, 1990; Lewis, Feiring, McGuffog, & Jaskir, 1984), whereas studies focused on more at-risk samples have (e.g., Easterbrooks, Davidson, & Chazan, 1993; Goldberg, Gotowiec, & Simmons, 1995; Lyons-Ruth, Easterbrooks, & Cibelli, 1997; Shaw, Keenan, Vondra, Delliquadri, & Giovannelli, 1997; Shaw & Vondra, 1995), one explanation that has emerged in this literature to explain such divergent findings is that attachment insecurity and disorganization should be thought

of as interactive risk factors that are more predictive when considered with other potential risk factors (e.g., socioeconomic disadvantage, parent psychopathology; Belsky & Fearon, 2002; DeKlyen & Greenberg, 2008; Fearon & Belsky, 2011; Kobak, Cassidy, Lyons-Ruth, & Zir, 2005). That said, it is important to note that some studies have found risk status not to heighten insecure children's risk for developing symptoms of psychopathology (e.g., Cicchetti, Rogosch, & Toth, 1998), and main effects of attachment insecurity on symptoms of psychopathology have emerged in low-risk samples (e.g., Bohlin, Hagekull, & Rydell, 2000).

Given the sheer volume and diversity of studies that have examined the contribution of early attachment security to the development of psychopathology and the complex pattern of findings that have emerged from such investigations, it has become virtually impossible to provide a clear narrative review of this literature. Accordingly, we recently conducted a series of meta-analyses to quantitatively evaluate the extant empirical evidence in light of key hypotheses regarding the significance of early attachment insecurity and disorganization (using observational assessments of mother-child attachment administered between 1 – 6 years) for the development of externalizing (Fearon, et al., 2010) and internalizing (Groh, et al., 2012) symptomatology. The need for such quantitative reviews of this literature to draw clearer conclusions regarding links between early attachment variation and psychopathology is evident by the fact that shortly after the publication of our meta-analysis on early attachment and internalizing symptoms, a second meta-analysis on the same topic was published (Madigan, et al., 2013). As the results of this meta-analysis largely converged with our own, we focus our discussion on the results from our own work.

Overall, these meta-analyses provide support for the hypothesis that early attachment insecurity heightens children's risk for developing externalizing and internalizing symptoms (Fearon, et al., 2010; Groh, et al., 2012; Madigan, et al., 2013). More importantly, however, as the meta-analysis on early mother-child attachment variation and externalizing symptoms includes nearly 70 independent samples comprising nearly 6,000 children and the meta-analysis on early mother-child attachment variation and internalizing symptoms includes over 40 independent samples comprising over 4,000 children, these meta-analyses provide a more precise estimate of the magnitude of such effects. Specifically, findings from these meta-analyses indicate that the effect of early mother-child insecurity on externalizing symptoms is modest (d = 0.31; Fearon et al., 2010) and significantly stronger than the surprisingly weak association between early mother-child insecurity and internalizing symptoms (d = 0.15; Groh et al., 2012).

Consistent with perhaps one of the most provocative hypotheses that has emerged in this literature that early attachment-relevant experiences have enduring implications for developmental (mal)adaptation (Sroufe, et al., 1990), the magnitude of the effects of early insecurity we documented in our meta-analytic work were not found to vary with the age at which internalizing and externalizing symptoms were assessed (Fearon et al., 2010; Groh et al., 2012), indicating that the association between early mother-child attachment insecurity and symptoms of psychopathology does not wane over the course of development from infancy to early adolescence. In light of such evidence, there is an urgent need for increased, theory-driven investigation of the mediating processes accounting for such effects. Indeed, questions remain regarding whether long-term continuities in the effects of attachment are due to the ongoing supportive function provided by attachment

relationships and/or the early effects of attachment experiences on the construction of stable psychological structures, such as internal working models. Currently, there is evidence in the literature to support both processes. For example, Belsky and Fearon's (2002) analysis of the NICHD Study of Early Child Care and Youth Development data at 1-3 years suggested that the effect of attachment tended to persist primarily when there was continuity in the quality of maternal care. An analysis of the same data set by Haltigan, Roisman, and Fraley (2013) revealed that early maternal sensitivity, a robust predictor of early security (Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2003; De Wolff & van IJzendoorn, 1997), had an enduring effect on children's psychopathology as rated by teachers through age 15, even after accounting for concurrent effects of maternal sensitivity. Given the importance of understanding how variation in the early mother-child attachment relationship exerts an enduring force on children's mental health, we return to this topic in the next section of this chapter.

Regarding the contribution of specific types of insecurity to the development of specific symptoms of psychopathology, results from these meta-analyses provide scant evidence for claims regarding the differential predictive significance of insecurity sub-types (avoidance, resistance, disorganization) for the development of externalizing versus internalizing symptomatology (Fearon et al., 2010; Groh et al., 2012; Madigan et al., 2013). Specifically, in contrast to claims that early avoidance increases risk for developing externalizing symptoms and early resistance increases risk for developing internalizing symptoms, we found that early avoidance was significantly associated with both internalizing (d = 0.17) and externalizing (d = 0.12) symptoms, and that early resistance was not significantly associated with internalizing (d = 0.03) or externalizing (d = 0.03) symptoms. However, partially supporting claims

that early disorganization increases risk for developing both internalizing and externalizing symptoms, early disorganization was found to be significantly associated with externalizing (d = 0.34), but not internalizing (d = 0.08), symptoms (Fearon et al., 2010; Groh et al., 2012). In light of recent factor analytic and taxometric evidence (e.g., Fraley & Roisman, in press; Fraley & Spieker, 2003; Haltigan, Leerkes, et al., in press; Haydon et al., 2012; Roisman et al., 2007), a potential reason why such theoretically unanticipated effects emerged in these meta-analyses might be that the traditional categorical coding systems used in developmental assessments of attachment may not completely capture the latent structure and taxonicity of attachment-related variation. In some studies, when empirically-derived dimensions of adult dismissing and preoccupied states of mind have been used, distinct and theoretically-anticipated correlates of adult attachment variation have been identified (Fraley & Roisman, in press; Fraley & Spieker, 2003; K. Haydon, Roisman, Marks, & Fraley, 2011; Whipple, Bernier, & Mageau, 2011). As such, the continuous avoidance and resistance dimensions of early attachment might prove useful in identifying distinctive links between specific patterns of attachment insecurity and the development of internalizing versus externalizing symptomatology beyond what the conventional categorization is able to achieve.

Following arguments that the magnitude of the effect of early attachment insecurity might vary according to the whether the child experiences other psychosocial stressors (Belsky & Fearon, 2002; DeKlyen & Greenberg, 2008; Kobak, et al., 2005), several moderators of the effect of attachment insecurity on the development of psychopathology were also examined in these meta-analyses. Focusing first on contextual risk factors that have been theorized to amplify the effect of attachment insecurity on the development of psychopathology, in contrast to

expectations, socioeconomic status was not found to moderate the effect of early insecurity on internalizing or externalizing symptoms (Fearon et al., 2012; Groh et al., 2012; Madigan et al., 2013). Such evidence therefore does not provide support for a diathesis stress model in which the influence of early attachment on maladaptation is theorized to be strongest in economically deprived populations. Regarding psychological risk factors, our meta-analytic work did indicate that insecure children were at especially heightened risk for developing externalizing symptoms (but not internalizing symptoms [Groh et al., 2012; Madigan et al., 2013]) if they were diagnosed with a clinical disorder or had a parent suffering from psychopathology (Fearon et al., 2010). Taken together, findings from these meta-analyses provide limited support for claims that the effects of early insecurity on psychopathology are magnified when children experience other risk factors.

However, it is important to note that relatively few studies have systematically examined the effect of multiple risk factors in combination (e.g., low SES, parental psychopathology, and/or clinical status). For example, evidence from the NICHD SECCYD indicates that the association between attachment and psychopathology is amplified under conditions of multiple contextual risk factors (Belsky & Fearon, 2002). Furthermore, in a recent paper, also using data from the SECCYD, Fearon and Belsky (2011) found statistically rather strong evidence that disorganized attachment, in particular, foreshadowed marked increases in teacher-reported externalizing behavior problems across the primary school years for boys reared in low-SES circumstances. Thus, these findings suggest that both gender and low-SES status might be relevant when considering attachment and the development of externalizing problems in childhood. In light of such evidence and theoretical arguments that the experience of multiple risk factors might be especially important for heightening

children's risk for psychopathology (Rutter, 1979), further research in this area focused on children experiencing multiple forms of psychosocial risk is needed.

Partially supporting claims that insecurity might heighten the risk for developing externalizing symptoms in boys and internalizing symptoms in girls (DeKlyen & Greenberg, 2008), the association between early mother-child insecurity and externalizing symptoms was found to be stronger for boys than girls (Fearon et al., 2010). In contrast, early mother-child insecurity was not more strongly associated with internalizing symptoms for girls than boys (Groh et al., 2012; Madigan et al., 2013). Instead, Madigan and colleagues (2013) found that insecure boys were also at significantly heightened risk for developing internalizing symptoms. Although Groh and colleagues (2012) also found that the effect of insecurity on internalizing symptoms was larger for boys than girls, the difference was not quite statistically significant (p = .06). This almost certainly non-significant difference in findings is attributable to the slightly different selection criteria of the meta-analyses. Importantly, however, findings from both meta-analyses clearly demonstrate that insecure girls are not at higher risk than boys for developing internalizing symptoms.

In addition to providing more precise estimates of the magnitude of the effects of early insecurity on internalizing and externalizing symptoms and identifying moderators of such effects, quantitative reviews of the literature on early attachment and psychopathology have also identified key gaps in this literature. For example, there is a clear paucity of research on the significance of children's attachment relationships with fathers for social and emotional development. Because of the relative neglect of father-child relationships in research on early attachment and internalizing (but see Fagot, 1995; Rothbaum, Rosen, Pott, & Beatty, 1995; Suess, Grossmann, & Sroufe, 1992) and externalizing (but see Aviezer, Sagi, Resnick, &

Gini, 2002) symptomatology, firm conclusions regarding the significance of such attachment relationships for the development of psychopathology cannot yet be drawn. There is clearly an urgent need for further research on the developmental significance of early father–child attachment security. Such research, in addition to examining the unique effects of father-child attachment on children's development, should also incorporate a broader family systems approach in which the interactive effect of attachment security with both parents is examined. For example, recent evidence suggests that developing a secure attachment relationship with one parent might offset the negative effects of developing an insecure attachment relationship with the other on children's mental health (Kochanska & Kim, 2013; see also Suess, et al., 1992).

In addition, the overwhelming majority of investigations of attachment and psychopathology have used the mother-reported Child Behavior Checklist (Achenbach, Edelbrock, & Howell, 1987) or the Teacher Report Form (Achenbach, 1991) of the Achenbach System of Empirically Based Assessment (ASEBA) as measures of children's externalizing and internalizing symptoms. Because parents and teachers might find it more difficult to report on internalizing symptoms than externalizing symptoms due to the more "public" and observable nature of externalizing versus internalizing symptoms, the heavy reliance on such reports in this literature might have contributed to the surprisingly small effect for early mother-child attachment security on internalizing symptoms. Accordingly, future research in this area should make use of trained observers (e.g., clinicians) of internalizing symptoms in order to determine whether the effect of early insecurity on internalizing symptoms is stronger when such reports are used.

Taken together, evidence from across the literature on the developmental significance of early attachment-relevant experiences for psychopathology suggests that the quality of the early attachment relationship that children develop with their mother has a modest, yet enduring, influence on the evolution of children's mental health over the early life course. Such evidence clearly demonstrates that avoidant or resistant attachment relationships are not inherently pathological. Instead, early attachment security and insecurity are best considered as protective or risk factors, respectively, that should be considered in a broader developmental model of psychopathology. The status of disorganized attachment is more difficult to outline due to a lack of systematic research efforts in clinical populations using adequate outcome parameters. Its strong association with child maltreatment (Cyr, et al., 2010) and with growing up in institutional settings (Bakermans-Kranenburg et al., 2011) might make disorganized attachment a clearer candidate for a direct causative agent in the emergence of psychopathology, perhaps particularly for disorders with a dissociative component (Carlson, 1998; Sroufe, et al., 2005b) or for problems related to aggression (Fearon, et al., 2010; Lyons-Ruth, et al., 1997).

The Search for Mediators

Although an extensive volume of research has examined the basic connection between attachment and children's functioning, considerably less has been done to track the longitudinal mediating processes, residing in the child, that could help account for attachment's beneficial or detrimental effects. However, quite a number of studies have examined cross-sectional and longitudinal associations between attachment and a range of theoretically plausible mediating variables. A diverse set of processes has been explored, from the underlying biology of stress regulation, to

cognitive and social-cognitive mechanisms involved in social perception and social action. Understanding these mediating factors is extremely important for a full account of the role of attachment in the development of psychopathology and, in principle, in the use of attachment concepts in intervention.

Physiological Mediators

Attachment behavior is assumed to serve as the infant's primary means of regulating stress, and hence a logical mechanism mediating long-term outcomes associated with attachment security and insecurity is via alterations in the functioning of the stress system. Extensive work in humans and animals testifies to the deleterious effects of chronic stress exposure, and of the role of sympathetic, parasympathetic, endocrine and immune systems in these effects on both emotional and physical health (Juster, McEwen, & Lupien, 2010). Furthermore, recent animal studies suggest that variations in parental care during an early critical period induce a set of more or less permanent epigenetic changes to the stress system (Weaver, et al., 2004). While these fascinating findings are difficult to investigate directly in humans, they nevertheless underline the close connections between early care and the neurobiology of stress. Seminal early work by Sroufe and Waters (Sroufe & Waters, 1977) and Spangler and Grossman (G. Spangler & Grossmann, 1993) first studied the relationship between attachment patterns and heart rate during the Strange Situation Procedure. Sroufe and Waters' original paper, based on detailed case studies, appeared to indicate that the heart rates of secure infants, relative to both resistant and avoidant infants, decelerated most quickly upon reunion, and also that avoidant infants, despite their outward demeanor, showed similar elevations in heart rate to the other attachment categories during separation. These initial findings thus provided support for two key predictions of attachment theory: 1) that avoidance is a secondary behavioral strategy for coping

with attachment-related stress, and not an indication of a lack of distress, and 2) that secure attachment behavior affords the infant a more efficient means of regulating physiological arousal. It is notable, however, that rather limited replication studies have been conducted to confirm these biobehavioral profiles of the secure and insecure attachment groups in the Strange Situation (see Fox & Hane, 2008) and the limited work done has not consistently found the same effects. Spangler and Grossman's (1993) study did not find differences in heart rate between secure and insecure infants during reunion, nor did Zelenko and colleagues (Zelenko et al., 2005) or Oosterman and Schuengel (Oosterman & Schuengel, 2007) in a sample of older children. However, Spangler and Grossman (1993) did find elevated heart rate in insecure infants, particularly disorganized infants, during the final separation episode in the Strange Situation. More recently, Hill-Soderlund and colleagues (2008) found that avoidant (vs. secure) infants exhibited greater decreases from baseline to separation in respiratory sinus arrhythmia (RSA), a marker of parasympathetic activity, suggestive of a greater recruitment of internal resources toward actively coping with stress. In a sample of 4.5-year olds, Stevenson-Hinde and Marshall (1999) found that secure children who also scored low on behavioral inhibition showed lower heart rate after reunion than other children. This may indicate therefore that temperament and attachment interact in determining the level of physiological stress observed during separation and reunion. This is a highly plausible explanation, as the former relates to children's reactive fearfulness or innate disposition to negative affectivity while the latter concerns how attachment behavior is deployed to regulate fear or negative affect. Similarly, Nachmias, Gunnar, Mangelsdorf, Parntz, and Buss (1996) found that more behaviorally inhibited children had higher post-stress cortisol levels if they were also insecure, but not when they were securely attached to their

mother. Security of attachment may thus buffer against stress or act as a moderator of the initial physiological disposition (see van IJzendoorn & Bakermans-Kranenburg, 2012).

Rather more work has explored the role of markers in the endocrine axis of the stress system, and in particular the hormone cortisol, which is a key player in the hypothalamic-pituitary-adrenocortical (HPA) axis (see Juster, et al., 2010). In a now classic study, Spangler and Grossmann (1993) measured 41 infants' salivary cortisol concentrations before and 15 and 30 minutes after the Strange Situation (in keeping with the relatively slow rise time of the cortisol response). Their results indicated that insecure infants showed greater increases in cortisol from baseline to post-Strange Situation, an effect that was most pronounced in the disorganized group. Nachmias and colleagues (Nachmias, et al., 1996) also found elevated cortisol responses to the Strange Situation in insecure infants, although in this case only among those infants who were assessed as temperamentally inhibited. Spangler and Schieche (1998) similarly found higher cortisol responses in the Strange Situation amongst insecure infants who were also highly temperamentally inhibited. Notably, it was the resistant infants in this case that showed the highest cortisol concentrations following the Strange Situation within this group.

A more recent study by Bernard and Dozier (2010) found evidence that disorganized infants (N = 8) may in fact show lower basal cortisol levels than infants in the other attachment categories (N = 24). Unlike all other studies conducted previously, Bernard and Dozier contrasted cortisol responses to the Strange Situation to a control task (play interaction), and found that disorganized infants showed a greater increase in cortisol specifically in response to the Strange Situation. For secure and organized insecure infants, neither the Strange Situation nor the play task elicited

a significant change from baseline in cortisol concentration. In light of the modest sample size, the lack of effect for the insecure organized groups is difficult to interpret. However, the study is very valuable in indicating the specific relevance of an attachment-related context for eliciting heightened stress responses from disorganized infants. Frigerio et al. (Frigerio, et al., 2009) failed to find heightened cortisol reactivity to the Strange Situation in a sample of 114 infants. In the largest study to investigate physiological function and attachment to date (N = 369), Luijk and colleagues (Luijk, Saridjan, et al., 2010) did not find evidence of greater cortisol reactivity to the Strange Situation among disorganized infants, but instead found that resistant infants showed the largest increases in cortisol from baseline to post-SSP, which was particularly pronounced when their mothers reported high levels of depression. The study also examined diurnal variation in cortisol, and demonstrated that disorganized children showed a more flattened diurnal cortisol pattern compared to non-disorganized children. In a follow-up paper on the same sample, Luijk, Velders, et al. (Luijk, Velders, et al., 2010) found that the cortisol reactivity effect of resistant attachment was greater still for infants with the T allele of the FKBP5 gene, which is involved in glucorticoid receptor function (and which showed a significant main effect on cortisol response as well). Related to that, Frigerio et al. (2009) examined several gene polymorphism that had been previously related to physiological stress sensitivity (5HTTLPR, GABRA-6 [GABA receptor gene], and COMT), and although no attachment-by-gene interactions were found for cortisol, two of these three genes interacted with attachment for another stress marker, alpha amylase. Alpha amylase, which is produced in saliva, is a sensitive marker of sympathetic nervous system activity, and results indicated that insecure children with relevant alleles in the 5HTTLPR (short-form) and GABRA-6 (CC genotype) genes

were prone to larger increases in alpha amylase in response to the Strange Situation. Taken together, although the evidence is not uniform, results of psychophysiological studies of attachment suggest that insecure infants show greater physiological arousal to separation and/or poorer down-regulation of stress during reunion. Several studies suggest that these effects are stronger or more robust when endogenous factors such as fearful or inhibited temperament, or certain gene polymorphisms, are also present.

In addition to the question of physiological function during separation-reunion situations, several studies have addressed the relationship between attachment security and stress sensitivity in contexts outside the Strange Situation, thereby addressing the generalizability of stress-attachment associations and their broader developmental significance. These studies indeed indicate that attachment influences stress responding outside the Strange Situation, particularly when combined with temperamental traits related to negative affect. Thus, in a cross-sectional study by Nachmias and colleagues (Nachmias, et al., 1996) insecure infants who were also temperamentally inhibited were found to show greater cortisol responses to a challenging/fear provoking task (not involving separation). Furthermore, in the same sample, Gunnar and colleagues found that insecure (as assessed at 18 months) and temperamentally inhibited infants showed greater cortisol responses to an inoculation at 15 months relative to secure, inhibited infants (Gunnar, Brodersen, Nachmias, Buss, & Rigatuso, 1996). Schieche and Spangler (2005) also found that infant attachment and temperamental inhibition interacted in their contribution to toddlers' cortisol responses to a challenging task. Specifically, resistant and disorganized, though not avoidant, infants who were also temperamentally inhibited, showed less of a decrease in cortisol concentration than secure inhibited toddlers and non-inhibited toddlers. The implication was that the flattened decline in this group reflected an

increase in cortisol output superimposed on the standard diurnal pattern. Van Bakel et al. (2004) failed to find direct evidence of greater cortisol reactivity to a challenging task in insecure 15-month olds, assessed using the attachment Q-set, but they did find that secure attachment moderated the association between stress responsiveness and cognitive function. Gilissen, Bakermans-Kranenburg, van IJzendoorn, and van der Veer (2008) showed that temperamentally fearful children with less secure relationships showed the highest skin conductance reactivity to the film clip, whereas comparable children with more secure relationships showed the lowest skin conductance activity. A particularly important example of work addressing the role of attachment in children's stress responses outside the Strange Situation is the work of Ahnert and colleagues (Ahnert, Gunnar, Lamb, & Barthel, 2004). These authors looked at children's stress response during the transition to childcare. Large increases in cortisol relative to baseline were observed during the transition to care in these toddlers, and differences in this response were found in relation to attachment security during the adaptation phase, when the toddlers' mothers remained present in the childcare setting. As expected, secure toddlers showed lower cortisol levels during this phase than their insecure counterparts. This difference was not apparent at later phases of the transition to childcare, when the mothers were no longer present.

Rather little work has directly tackled the *longitudinal* associations between attachment and physiological function. However, an important study by Burgess, Marshall, Rubin, and Fox (2003) found that avoidant attachment, though not concurrently associated with RSA in infancy (14 months) was predictive of *lower* resting heart rate and RSA at age 4 years. Avoidant infants, particularly those that had also been assessed as temperamentally uninhibited at age 2, also had higher rates of

externalizing behavior problems. This set of associations is significant in light of the fact that lower resting heart rate is a consistent correlate of externalizing behavior problems in childhood and adolescence (Ortiz & Raine, 2004). It has been argued that this pattern of physiological hypoarousal, in addition to being influenced by genetic and temperamental factors, may result from developmental changes in the stress system in which early chronic stress leads to a subsequent dampening of the stress system (Gunnar & Quevedo, 2007). Thus, one might speculate that one pathway from attachment insecurity to externalizing problems occurs via downward alterations in the stress system brought about by early physiological hyperarousal associated with avoidant attachment. The modest effect size for the association between avoidance and externalizing problems referred to earlier might suggest that this association is contingent on other risk factors, either temperamental in nature, or related to other psychosocial variables.

One key issue that has not been rigorously addressed thus far is the role of parental behavior in accounting for associations between attachment and children's stress functioning. There is ample evidence that the quality of parental care is linked to the effectiveness with which the child's physiological arousal is regulated, and it is unclear whether this can explain the effects of attachment, or whether the child's attachment behavior or pattern makes a unique and distinctive contribution (Gunnar, 2005). This is an important area for future research.

Of particular note, two studies have reported positive effects of attachment-focused interventions on cortisol function in young children. Dozier, Peloso, Lewis, Laurenceau, and Levine (Dozier, Peloso, Lewis, Laurenceau, & Levine, 2008) found that their Attachment and Bio-behavioral Catch-up (ABC) intervention, which is focused on promoting security of attachment and in supporting the child's stress

regulation through sensitive and responsive care, led to a reduction in basal cortisol in a sample of infants and toddlers in foster care, relative to a randomly assigned control treatment (RCT). Bakermans-Kranenburg, van IJzendoorn, Pijlman, Mesman, and Juffer (2008) also examined changes in cortisol function in an RCT of a sensitivity-focused video-feedback intervention for toddlers at risk of behavioral problems. Although these authors found no main effect of the intervention on cortisol activity, as assessed at home during the course of the day, they found an interaction between the intervention and variation in the dopamine D4 VNTR. Among children with the 7-repeat allele of the dopamine receptor gene, who might be considered at risk of cortisol hyper-reactivity, the intervention appeared to lead to a reduction in basal cortisol. Of course, what cannot be determined is whether changes in security of attachment, sensitivity of care, or both, mediate these physiological outcomes, although the latter study also indicated that children with the 7-repeat allele showed the strongest decrease in externalizing problems when their mothers increased more than average in the use of sensitive discipline strategies (Bakermans-Kranenburg, van IJzendoorn, Pijlman, et al., 2008). These studies provide important evidence concerning the causal role of parental sensitivity either via attachment or independently, on the child's functioning at the level of biology. Further work along these lines in the future would be highly desirable, particularly studies testing the mediating role of treatment-related changes in physiology for children's subsequent adjustment.

In summary, there is reasonably consistent, albeit mostly correlational, evidence that attachment security and insecurity relate in theoretically predicted ways to variations in young children's stress functioning. There is evidence that this relationship, particularly with respect to cortisol, but possibly other stress markers as

well, is moderated by a range of factors, including maternal depression, temperament and genetic factors considered more broadly. In general, the evidence tends to suggest that the disorganized and resistant groups are most prone to increased cortisol responses to separation or other stressors. Further, it remains unclear whether attachment plays a specific role that can be distinguished from the ongoing effects of parental support in these associations. Finally, children's stress physiology appears to be modifiable by attachment-focused interventions, although how generalizable and sustained these effects are remains to be established. Thus far, no study has directly tested the role of stress physiology in mediating the links between attachment and children's developmental outcomes in correlational or treatment studies.

Cognitive, Social-Cognitive and Affective Mediators

As noted previously, a range of *psychological* mechanisms have been proposed as potential mediators of the effects of attachment insecurity and disorganization on children's adaptation and risk for maladjustment. However, remarkably little work has systematically investigated the psychological or affective mechanisms mediating longitudinal associations between attachment and later outcomes. Nevertheless, studies do suggest that attachment is coherently linked to several cognitive and affective functions, in ways that are broadly in line with predictions from attachment theory. For an excellent in-depth review, the reader is encouraged to read Dykas and Cassidy (2011). In the following sections, we summarize the results of studies testing links between attachment and a) social information processing, b) Theory of Mind, and c) emotional reactivity and regulation.

Social information processing. A number of studies have investigated the natural interpretation arising from attachment theory that internal working models

should influence children's encoding and interpretation of social experiences or socially-relevant cues in systematic ways. One of the earliest studies to examine this idea was conducted by Cassidy and colleagues (Cassidy, Kirsh, Scolton, & Parke, 1996). In the first of their reported experiments they followed a group of 60 3.5 year-old children who had been observed in the Strange Situation at 15-18 months in order to assess several aspects of their representations of, or social-information processing about, peers. In the first experiment, children were read several stories involving social interactions in which the participant was the imagined protagonist. Following a social-challenge event (e.g., the child is hit by a ball, their toy is broken by a peer), the experimenter asked a number of questions regarding peer intentions, imagined social responses that the child might engage in, and their thoughts about their peers' feelings. Although inferred intentions did not vary by prior attachment status, avoidant children tended to imagine engaging in more negative social actions in response to the challenge (than previously secure and resistant children). In a second experiment, older children's (Grade 1) responses to the same stories were examined in relation to concurrent attachment security as assessed using the Main and Cassidy procedure (1988). In this older sample (N = 33), evidence emerged of insecure children's tendency to infer hostile intentions to peers, to entertain negative social actions in response to peer challenge and to provide less positive responses regarding their peers' feelings after the event had occurred. The findings also indicated that these differences in thinking style were related in turn to the quality of children's peer relations, as assessed via a sociometric instrument. A subsequent study by Kirsh and Cassidy (1997) looked at children's attention to attachment-relevant stimuli (pictures of mother-child interactions of varying valence) using the same cohort as study 1 in Cassidy et al. (1996). In the first task, they showed children three pictures side-by-

side, depicting positive, negative and neutral interactions. Although no differences were found in children's looking time to pictures of differing valence, avoidant children tended to look away from the stimuli more frequently than the other groups in general. Of course, while the content of the stimuli may well have been relevant to this difference, it is also possible that general inattentativeness could also explain such a finding. To test this, they showed children attachment-relevant and attachment-irrelevant images side by side and measured their looking time. Consistent with expectations, the authors found that insecure children spent less time looking at the attachment-relevant images, compared to the attachment-irrelevant images, than their secure counterparts. In the same sample, Kirsh and Cassidy also found evidence to suggest that recall for attachment-relevant stories may be biased by attachment security, with previously secure children showing better memory for stories involving responsive care than insecure children. More recently, in a sample of 7-8 year olds, Ziv, Oppenheim and Sagi-Schwartz (2004) used films depicting negative, neutral or ambiguous peer responses to a bid by the study child to initiate play, in order to test the association between early attachment and attributional biases. Possibly reflecting Cassidy et al.'s finding in their experiment 1, Ziv et al., did not find differences associated with attachment at the level of attribution, but rather in their evaluations of prosocial responses. In particular, secure children tended to endorse a greater belief in the value (and positive consequences) of competent social responses to the peer challenge than insecure children. Although working with a much older age group, Dykas, Woodhouse, Ehrlich and Cassidy (2012) recently presented fascinating evidence regarding the connections between social-information processing and adolescent attachment. In this study, adolescents interacted with an unfamiliar peer for 10 minutes, and were then subsequently interviewed regarding their perceptions or

recollections of that interaction. Immediately after the interaction adolescents' perceptions of the interaction did not differ according to their attachment status. However, when the same assessment was repeated two weeks later, insecure adolescents' recollection of the interaction shifted in a negative direction more steeply than secure adolescents, viewing the interaction as having been less positive and more hostile (on the part of the unfamiliar peer). The majority of these studies (with the exception of Cassidy et al., 1996; experiment 2) have not directly tested whether these social-cognitive processes might mediate attachment effects on social competence or psychopathology (though see Raikes & Thompson, 2008, for one study not finding mediation).

Theory of Mind. Several authors have suggested that attachment may promote the development of children's Theory of Mind, or mentalizing abilities, and that this might provide an account of the longitudinal benefits associated with secure attachment. At least nine papers have been published reporting on the association between attachment and theory of mind, as assessed by a range of procedures designed to measure false belief understanding or perspective taking. These studies have produced mixed results. One of the first of these was a report by Meins and colleagues (Meins, Fernyhough, Russell, & Clark-Carter, 1998). Using an unexpected transfer task, they found that children who had been secure in infancy showed superior false belief understanding at age 4 (though not age 5). This longitudinal finding from infancy to age 4 was replicated more recently by McElwain and Volling (2004), although not by Meins, Fernyhough, Wainwright, Das Gupta, Fradley and Tuckey (2002) or Symons and Clark (the latter relating age 2 security to age 5 false belief understanding, see Symons & Clark, 2000). Laranjo and colleagues did not find overall associations between attachment, as assessed with the AQS at age 15 months,

and perspective taking at age 2 years, although an association was apparent for boys (Laranjo, et al., 2008). In an early cross-sectional study, Fonagy, Redfern and Charman (1997) found that attachment, as measured with the Separation Anxiety Test, was associated with belief-desire reasoning in a sample of 3-6 year olds (see also De Rosnay & Harris, 2002). Other cross-sectional studies have also produced positive findings (Arranz, Artamendi, Olabarrieta, & Martin, 2002; Repacholi & Trapolini, 2004; Symons & Clark, 2000) as well as at least one negative finding (Greig & Howe, 2001). Broadly speaking then, there is evidence that attachment may be related to theory of mind performance, but the association is not consistently replicated, particularly in longitudinal studies. Meins and colleagues (2002) argue that maternal mind-mindedness, which as we noted already is correlated with attachment security, is a more robust predictor of children's theory of mind performance than attachment, and may account for its apparent effects.

There is relatively consistent evidence that attachment is associated with children's recognition and understanding of emotions (as opposed to false beliefs). For example, Steele and colleagues (Steele, Steele, & Croft, 2008; Steele, Steele, Croft, & Fonagy, 1999) found that children aged 6 (though not 11) who had previously been insecure with their mothers in infancy were poorer at labeling emotional faces, particularly positive emotions, and understanding mixed emotions, than secure children. In a cross-sectional study of 7 year olds, Colle and Del Guidice (2011) found that insecure children (as assessed with the Manchester Child Attachment Story Task, MCAST, Goldwyn, et al., 2000) performed less accurately in matching pairs of dynamic emotional faces. Laible and Thompson (1998) found that secure children (using mother-completed AQS) between the ages of 2.5 and 6 years performed better on an emotional perspective taking task (after controlling for age),

an effect which was mostly apparent in relation to negative emotions. These results were also replicated by Greig and Howe (2001) in a sample of 4.5 year olds assessed using the Attachment Story Completion Task of Bretherton, Ridgeway and Cassidy (1990) and in two low-SES samples of preschoolers (Kidwell et al., 2010; Raikes & Thompson, 2006). Notably, in the Raikes and Thompson (2006) study, mother-child conversations in secure dyads tended to involve more frequent reference to emotion terms, which itself was associated with children's emotional perspective taking/understanding (see also Oppenheim, Koren-Karie, & Sagi-Schwartz, 2007; Raikes & Thompson, 2008). Although few studies have examined clinical samples, Barone and Lionetti (2012) found that disorganization in the MCAST was associated with poorer overall emotion comprehension (indicating recognition of emotion, understanding the causes of emotion and emotion regulation strategies) in a sample of late-adopted preschoolers.

Overall then, there is relatively consistent evidence that attachment security is related to better emotion recognition and emotion understanding in preschool and school aged children, although existing studies tend to be based on modest samples, using a wide range of tools for assessing attachment and emotion understanding, and longitudinal data beginning in infancy is limited. Few studies have thus far directly tested the mediating role of emotion understanding or theory of mind in the association between attachment and psychopathology. The broader literature on the developmental significance of social-cognitive skills in children's social competence suggests that this is a hypothesis worthy of further investigation (e.g., see Astington, 2003). As eloquently summarized by Oppenheim (2006), many authors in the field see deep connections between security of attachment, the coherence of internal working models, and the ways in which parents and children co-construct affectively

meaningful narratives of social and relational experiences during interactions. These internalized, co-constructed narratives, scripts or models may then shape future interpersonal and emotional functioning, in ways that may enhance or undermine adaptation and adjustment. The evidence reviewed in the previous sections appears broadly consistent with this way of thinking.

Emotional Reactivity and Self-regulation

The first longitudinal studies of attachment and later child development drew attention to the potentially important mediating role of the child's emerging capacity for self-regulation (Arend, Gove, & Sroufe, 1979). Arend and colleagues (1979) for example found that infants classified as secure at 18 months showed greater ego-resiliency and ego-control as preschoolers, based on both laboratory observations and reports from kindergarten teachers. Similarly, in the well-known Minnesota study (Sroufe, et al., 2005b), consistent evidence was found suggesting that insecure children were more dependent on teachers in preschool and preadolescence (Urban, Carlson, Egeland, & Sroufe, 1991). Gilliom, Shaw, Beck, Schonberg and Lukon (2002) examined emotion-regulation strategies directly in a sample of low-SES 3.5 year-old boys by observing emotion-regulatory behaviors during a task designed to elicit frustration. The authors coded regulatory behaviors, including active distraction, seeking information, passive waiting, and comfort-seeking as well as the child's overall emotional response. In addition to showing that the hypothesized regulatory behaviors did reduce children's levels of anger in temporal contingency analyses, they also found that secure boys tended to employ more of these regulatory behaviors during the frustration task than insecure boys. These connections between emotional reactivity and regulation appear to emerge early in development. For example, Leerkes and Wong (2012) found that during a frustration task avoidant infants

engaged in greater self-soothing and used fewer mother-directed regulatory behaviors than secure infants, and that resistant infants showed more negative affect and engaged in fewer adaptive regulatory strategies. Similarly, Sherman, Stupica, Dykas, Romas-Marcuse and Cassidy (2013) found that resistant infants at age 1 showed the greatest emotional reactivity in a frustration task, and avoidant infants the least, with secure infants falling in the middle. Somewhat consistent with this, Martins and colleagues (Martins, Soares, Martins, Tereno, & Osorio, 2012) found that avoidant infants showed less emotional reactivity during object-focused play with the mother than secure or resistant infants. Underscoring the potential importance of emotion-related processes for psychopathology, Murray and colleagues (Murray et al., 2011) recently found that the association between maternal postnatal depression and later offspring depression was mediated by a pathway involving insecure (primarily avoidant) attachment at 18 months and low ego-resilience in childhood. Finally, Dawson and colleagues (Dawson et al., 2001) have also presented data indicating that insecurely attached infants show differences in EEG spectra – specifically reduced relative left frontal alpha power – than securely attached infants. Such neural effects are interesting, because alpha asymmetries of this nature have been found to be quite stable over time (Vuga, Fox, Cohn, Kovacs, & George, 2008) and are associated with negative emotionality and behavior problems in infancy and toddlerhood (e.g., Dawson et al., 2003).

Berlin and Cassidy (2003) directly addressed the suggestion indicated by several past studies that mothers of insecurely attached infants react in systematic ways to encourage or discourage the infant's affect expressiveness. Mothers were asked a series of questions regarding their attitudes to their child's emotions, and in particular their tendency to control their child's expression of negative affect. Mothers

of avoidant children reported exerting greater control, and mothers of resistant children less control, over their child's emotions than mothers of secure children. These findings are quite consistent with theorizing by Cassidy (1994) and Berlin and Cassidy (1994), that parental working models of attachment influence mothers' unconscious responses to the child's affect that in turn serve to regulate or maintain the parent's state of mind with respect to attachment.

In addition to emotion-regulation, some studies have also indicated that security of attachment may influence children's self-regulation skills more broadly. For example, using data from the NICHD SECCYD study, Fearon and Belsky (2004), found that insecure attachment in infancy was associated with later attentional control, as measured objectively using a continuous performance test at age 54 months. The connections between attachment and attentional control in this study also appeared to be amplified by social-contextual risk, particularly for boys. In a more recent paper, Drake, Belsky and Fearon (Drake, Belsky, & Fearon, 2013) examined teacher's reports of social self-control between grades 1 and 5 and found that earlier security, at both 15 months and 3 years, predicted higher levels of social self-control. Social self-control in turn predicted grade 5 school engagement, and mediated the effects of early attachment on school engagement.

Thus, there is evidence that attachment is associated with a broad range of cognitive, social-cognitive and emotional competencies that are plausible candidates for mediating mechanism in the effect of attachment security and insecurity on children's adjustment. Relatively little work has systematically examined these processes longitudinally and tested mediation directly, and fewer studies still have examined these various candidate mediators simultaneously, to tease apart their joint and independent effects. The greater capacity for flexible emotion-regulation or self-

regulation might plausibly underpin some of the other competencies associated with security, including emotion understanding and empathy (e.g., see Panfile & Laible, 2012), as well as mediate effects of attachment on later emotional and behavioral problems (e.g., see Belsky, Fearon, & Bell, 2007), but large-scale studies designed to test this programmatically have yet to be done.

Adult Attachment and Psychopathology

The conceptual links between attachment and psychopathology have been examined for both infant attachment and adult attachment classifications. Past theorizing tended to assume that children with a resistant attachment should show more internalizing problems, and avoidant children would be at risk for externalizing problems, whereas children with disorganized attachment relationships might be at a heightened risk for developing either internalizing or externalizing symptoms (see previous section). As noted earlier in this chapter, meta-analytic results provided only partial support for these hypotheses, in particular the role of resistant attachment appeared to be less clear-cut than expected (see Fearon, et al., 2010; Groh, et al., 2012).

The expected associations between the organized adult attachment classifications and psychopathology were roughly analogous to those suggested for children: preoccupied attachment representations might be associated primarily with internalizing disorders such as depression or borderline personality disorder, whereas dismissing representations were expected to be associated with externalizing indices of distress, such as eating disorders, conduct disorders, and hard-drug use (Tyrrell & Dozier, 1997; Tyrrell, Dozier, Teague, & Fallot, 1999). Contrary to infant disorganized attachment however, the hypothesis concerning the psychopathological

correlates of unresolved attachments were more distinctively suggested to be in the range of disorders with a dissociative component such as post-traumatic stress disorders (Harari et al., 2009; Hesse, 1999; Liotti, 2004; Sroufe, et al., 2005b).

From the number of studies involving clinical samples it is evident that from the early years onwards the AAI has been considered relevant to psychopathology. Selecting studies that were based on the original coding system with the conventional three-way and four-way classifications of the AAI (Main, et al., 2003), Bakermans-Kranenburg and van IJzendoorn showed in a review of the first 10,000 AAIs that 76 out of 218 studies involved clinical samples, whereas 'only' 36 studies focused on non-clinical low-risk mothers, and 13 on fathers (Bakermans-Kranenburg & van IJzendoorn, 2009).

The non-clinical low-risk North-American mothers provided a norm distribution for comparison with classification frequencies in clinical groups. They showed a combined distribution of 23% dismissing, 58% autonomous, and 19% preoccupied classifications (N = 748). With the unresolved category included, the norm distribution was 16% dismissing, 56% autonomous, 9% preoccupied, and 18% unresolved classifications (N = 700). These distributions were quite similar to those in the larger group of all non-clinical and not at-risk groups (irrespective of gender, country, age, and parenthood), with a three-way distribution of 29% dismissing, 56% autonomous, and 14% preoccupied (N = 4392), and a four-way distribution of 24% dismissing, 50% autonomous, 9% preoccupied, and 16% unresolved (N = 4454). Thus, albeit a "clean" and therefore selective group of North-American non-clinical low-risk mothers, its usefulness as a norm group is corroborated by its similarity to the larger, more global group of non-clinical samples.

As expected, the combined clinical groups showed an extremely deviating distribution of AAI classifications compared to the norm group. In the combined clinical samples, 37% were classified as dismissing, 27% as autonomous, and 37% as preoccupied. In short, a large majority (73%) of the clinical adults (N = 1956) were classified as insecure. Clinical samples were more often dismissing than the norm group, and in contrast to samples at-risk (e.g., single low SES mothers, adolescent mothers) they were also more often preoccupied. With the unresolved category included, the combined sample of clinical individuals showed the following distribution: 23% dismissing, 21% autonomous, 13% preoccupied, and 43% unresolved. The unresolved category was strongly overrepresented, and the dismissing and preoccupied categories were overrepresented as well, but to a lesser extent than the unresolved category.

In search for links between specific disorders and one or more of the insecure attachments we compared the combined distributions of clinical samples of a similar kind with those of the norm group. Disorders with an internalizing orientation, in particular borderline personality disorders, have been suggested to be associated with maximizing attachment signals. Indeed, the three-way distribution of suicidal and borderline patients showed a significant overrepresentation of preoccupied attachments, whereas dismissing attachments were not significantly overrepresented. In the four-way distribution unresolved attachments were also overrepresented. Similarly, individuals with abuse experiences and/or current PTSD were particularly characterized by unresolved loss or trauma. In contrast, depressive symptomatology was not related to higher rates of unresolved attachment, but both in the three-way and four-way distributions dismissing and preoccupied classifications were overrepresented.

The strong association between PTSD and unresolved loss or trauma is perhaps to be expected given the similarity in indicators, notably intrusive symptoms and avoidance (Fearon & Mansell, 2001). Stovall-McClough and Cloitre (2006) found that abused women who were classified as unresolved with regard to trauma were 7.5 times more likely to be diagnosed with PTSD. Examining combat veterans with PTSD, the continuous score for unresolved deployment-related trauma overlapped almost completely with severity of PTSD (r = .80) in one study (Harari, et al., 2009). The overlap between unresolved loss and PTSD in the other study was 50%, but in that study combat-related traumatic experiences were not queried in the AAI, decreasing the overlap between PTSD and unresolved state of mind (Nye et al., 2008). Such results could be considered as validation of the unresolved category; however they also show the limits of the coding system in terms of the incremental validity of the classification over existing PTSD measures such as the CAPS (Clinician Administered PTSD Scale; Blake et al., 1998).

Schizophrenia appeared to be related to dismissing attachment, but only one study was available at the time of the meta-analysis (Tyrrell & Dozier, 1997). More recently, one study using the AAI added to that database, confirming the link with dismissing attachment in a sample of 34 patients with a first episode of psychosis (MacBeth, Gumley, Schwannauer, & Fisher, 2011). Self-reported schizotypal symptomatology was related to AAI unresolved trauma and unresolved loss in a psychiatric sample of trauma survivors (Riggs et al., 2007). Other studies used self-reported adult attachment measures and are thus basically incomparable, and the results were inconsistent (versus Ponizovsky, Nechamkin, & Rosca, 2007; e.g., Ponizovsky, Vitenberg, Baumgarten-Katz, & Grinshpoon, 2013).

Externalizing problems, in particular antisocial or conduct disorders, were expected to be associated with dismissing attachments, which was confirmed; however at the same time the preoccupied category was also overrepresented. The four-way distribution demonstrated that externalizing problems were associated with increased rates of unresolved loss or trauma as well. When distinguishing between the various types of violence, that is violence within the family (against partner or child), against the outside world (criminal offenders), or against the own body (eating disorders, drug addiction), we found that family violence was associated with more preoccupied representations, whereas violence against the outside world was strongly associated with dismissing attachment representations, and self-directed violence with both dismissing (three-way) and preoccupied and unresolved (four-way) classifications. The three-way and four-way distributions of samples with self-directed violence were based on samples that showed hardly any overlap (the majority of these studies presented *only* three-way or four-way distributions). This may explain the pattern of results with an overrepresentation of the dismissing classification in the three-way distribution, and an overrepresentation of the preoccupied classification in the four-way distribution. A more recent study on incarcerated women, most of whom had been convicted for drug-related crimes, showed an underrepresentation of secure classifications and an overrepresentation of preoccupied and unresolved classifications (Borelli, Goshin, Joestl, Clark, & Byrne, 2010).

Given that the AAI was developed in the context of the prediction of infant-parent attachment and child socio-emotional development, one might expect an enhanced risk of parental insecurity in samples with child psychopathology. Insecure parental attachment increases the likelihood of insensitive parenting (van IJzendoorn, 1995), biased perceptions of child behaviour and intentions, harsh discipline

(Verschueren, Dossche, Marcoen, Mahieu, & Bakermans-Kranenburg, 2006), and instability of the caregiving environment (e.g., Crowell, Treboux, & Brockmeyer, 2009). Indeed, the large majority of parents of children with psychopathology were found to be insecure (83%). Both the dismissing and preoccupied classifications were overrepresented. Importantly, only psychological problems appeared associated with more insecure attachment, not physical disability, even if they were severe and with hampering consequences for social interactions, like blindness or deafness. The set of studies with adults with physical handicaps was small, but the finding that their attachment distributions did not significantly deviate from the norm is important in terms of discriminant validity (Bakermans-Kranenburg & van IJzendoorn, 2009).

From a clinical perspective, the Cannot Classify classification might be of particular interest. This category, identified by Hesse (1999, 2008), was intended to capture AAIs that showed a global collapse of coherence across the entire discourse. Contrasting strategies for maximizing and minimizing the expression of attachment within the context of one and the same interview is a hallmark of this classification. Hesse and Minde (Minde & Hesse, 1996) presented a case study of a mother with highly conflicted feelings toward her role as a caretaker, where the identification of her attachment representation as Cannot Classify (incoherent and switching between contrasting strategies) helped the therapist in choosing a specific treatment approach. In normal, non-clinical samples hardly any adult is assigned this classification, but in samples of criminal offenders (van IJzendoorn et al., 1997), victims of sexual abuse (Stalker & Davies, 1998) and suicidal adolescents (Adam, Sheldon-Keller, & West, 1996) the category was overrepresented. However, at the time of the meta-analysis an insufficient number of AAI studies with separate Cannot Classify ratings hampered

testing the association of this category with psychiatric disorders, and that situation has not changed since.

One study reported on the association between psychopathology and reflective functioning. Reflective functioning in the context of the AAI refers to the adult's capacity to reflect upon memories of the childhood relationship with the parents in mentalizing terms, that is, showing awareness of mental states in others, and the ability to experience one's own and others' emotions in a non-defensive way without becoming overwhelmed (Fonagy, Target, Steele, & Steele, 1998; Slade, 2005). Reflective functioning is closely related to metacognitive monitoring during the AAI, and indeed associated with AAI security (Fonagy, Steele, Steele, & Holder, 1997). During the AAI, female inpatients with depression showed significantly lower capacity for mentalization as assessed with the Reflective Functioning scale than healthy controls (Fischer-Kern et al., 2013).

A literature search with the key words *adult attachment* and *psychopathology* shows that not that many studies with clinical samples have accumulated after our meta-analysis was published in 2009. The majority of the studies on clinical samples used self-report measures of adult attachment, such as the Attachment Style Questionnaire (Feeney, Noller, & Hanrahan, 1994), or the Experiences in Close Relationships questionnaire (Bartholomew & Horowitz, 1991; see also Mikulincer & Shaver, 2007). The preference for an efficient paper-and-pencil or website-based instrument is not difficult to understand, but the results are—notwithstanding some early optimism (e.g., Bernier & Dozier, 2002; Shaver & Mikulincer, 2002) —not directly comparable with those of the AAI. As demonstrated meta-analytically for non-clinical samples, the overlap between the AAI and adult attachment questionnaires is trivial to small (r =.09; Roisman, Holland, et al., 2007). Similarly, in

a psychiatric sample of trauma survivors self-report and AAI attachment classifications were not related, and different associations with psychological dysfunction emerged for the two measures (Riggs, et al., 2007). In a study on pregnant women from deprived backgrounds, Pianta, Egeland and Adam (1996) found that preoccupied adult attachment representations appeared to be associated with highest levels of self-reported psychopathology (as assessed with the Minnesota Multiphasic Personality Inventory-2 [MMPI-2]) whereas females with dismissing attachments showed the lowest levels of psychopathology as they emphasized independence and low anxiety. The secure-autonomous individuals scored in-between the two insecure groups. This suggests that self-reports of attachment, parenting style or psychopathology may suffer from systematic response biases with overly negative and worried reports by individuals with preoccupied attachments, and overly positive and defensive reports by dismissing individuals.

In sum, whereas the original hypotheses suggested that preoccupied attachment representations might be associated primarily with internalizing disorders, dismissing representations with externalizing problems (Tyrrell & Dozier, 1997; Tyrrell, et al., 1999), and unresolved attachments would predispose to the development of disorders with a dissociative component such as post-traumatic stress disorder, the emerging evidence confirms only the latter hypothesis consistently: indices for unresolved loss or other trauma are strongly correlated with post-traumatic stress symptoms assessed independently. Externalizing and internalizing disorders both show elevated levels of preoccupied and dismissing attachments but more specific associations have remained equivocal across studies. Firm evidence on the causal direction of the associations is still largely absent because the overwhelming majority of studies in this area are correlational with most of them concurrently

measuring both attachment and psychopathology. More experimental studies are therefore badly needed.

Mechanisms in adult attachment and psychopathology

What are the neural mechanisms underlying attachment-related individual differences in parenting behaviour? Adults with insecure internal working models of attachment may process attachment-relevant social information in one of two ways, either defensively excluding the information from further processing, or processing the information in a negatively biased manner, congruent with their negative attachment-related experiences (Dykas & Cassidy, 2011). In the past decade, the neural mechanism underlying the perception of infant attachment signals, in particular infant crying, has been the focus of several functional Magnetic Resonance Imaging (fMRI) studies. These studies have shown that a highly interactive cognitive-affective neural network is involved in the perception of infant crying (Bos, Panksepp, Bluthe, & van Honk, 2012).

The amygdala is an important functional hub within this network. The amygdala is part of the limbic system and plays a role in the detection of threat and the experience of fear and aversion (Davis & Whalen, 2001; Fusar-Poli et al., 2009; Gamer, Zurowski, & Buchel, 2010; Morris et al., 1998). It is activated during exposure to infant crying (Lorberbaum et al., 2002; Riem et al., 2011; Seifritz et al., 2003) and connected with other brain regions that are involved in the perception and evaluation of crying such as the orbitofrontal cortex and the anterior cingulate cortex (Riem et al., 2012). Heightened amygdala activation is an indication of hyperemotionality and has been observed in depression and anxiety disorders (Rauch

et al., 2000; Yang et al., 2010) and in intrusive mothers (Atzil, Hendler, & Feldman, 2011).

Several fMRI studies also point to a role of the amygdala in the processing of attachment-related information. For example, Buchheim et al. (2006) found elevated amygdala activation in individuals with unresolved loss during the Adult Attachment Projective (AAP). In 10-year-old children amygdala hyperactivity was found to mediate the association between adverse early attachment experiences (growing up in institutionalized care) and decreased eye-contact during dyadic interaction (Tottenham et al., 2011). This indicates that early adverse attachment experiences affect amygdala activity, possibly because of the vulnerability of the amygdala to environmental exposures in early life (Lupien, McEwen, Gunnar, & Heim, 2009; Sabatini et al., 2007) which in turn influences social behavior. Amygdala hyperactivity might thus be one of the mechanisms underlying the association between adult attachment representation and insensitive parenting.

A number of fMRI studies on the influence of adult attachment have focused on the perception of infant facial expressions. Strathearn et al. (2009), examining neural responses to own infant smiling and sad faces, found that mothers with an insecure attachment representation (as assessed with the Crittenden coding system) showed less activation in dopaminergic reward regions such as the ventral striatum compared with secure mothers. Lenzi et al. (Lenzi et al., 2012) found that individuals with a dismissing AAI classification showed more activation in the limbic and mirror neuron system and greater deactivation in the OFC and ACC in response to infant facial expressions compared with individuals with a secure representation. The authors suggest that hyperactivation of limbic and mirror system areas may reflect emotional dysregulation of infantile experiences of rejection and lack of protection,

whereas increased deactivation of fronto-medial areas may be the expression of the inhibition of attachment behaviors, which is a typical aspect of dismissing attachment. Galynker et al. (2012) examined the influence of depression and AAI insecurity on neural responses to images of the participant's mother, friend or a stranger. No effects of attachment security on amygdala activation were found, perhaps because of the absence of negative affective stimuli.

The amygdala thus seems to be involved in both adult attachment and the perception of infant signals. Riem et al. (2012) explored whether amygdala hyperactivity played a role in the relation between insecure adult attachment representations and negative emotional and behavioral responses to infant crying. Adults with insecure attachment representations showed heightened amygdala activation when exposed to infant crying compared to individuals with secure attachment representations. In addition, they reported more irritation during infant crying, and they used more excessive force as indicated by grip strength using a hand-grip dynamometer during exposure to infant crying. The relation between attachment representation and emotional or behavioral responses to infant crying was however not mediated by amygdala activation, indicating that feelings of irritation and the use of excessive force in response to infant crying in insecure individuals cannot be solely explained by a hyperactive amygdala. Other brain regions involved in attachment-related influences on the perception of infant crying may be regions important for empathy and emotion understanding, such as the insula and the inferior frontal gyrus (IFG). Intranasal administration of oxytocin decreased amygdala responses and increased insula and IFG responses to infant crying (Riem, et al., 2011).

Disruptions in amygdala *connectivity* may also play a role in the negative perception of infant crying in insecure individuals. The amygdala is strongly

connected with other brain regions within a neural network involved in the perception and evaluation of crying (Riem, et al., 2012), and neural disorganization within this network has been associated with anxious parenting (Atzil, et al., 2011). Disruptions in amygdala connectivity have been observed in patients with depression and anxiety disorders (Dannlowski et al., 2009; Pillay, Gruber, Rogowska, Simpson, & Yurgelun-Todd, 2006) and might also play a role in insecure attachment representations.

It has been proposed that the attachment system would be located in the orbitofrontal cortex (OFC) (Schore, 2001). The OFC is involved in reward processing, emotional regulation, and the perception of infant signals (Banks, Eddy, Angstadt, Nathan, & Phan, 2007; Kringelbach, 2005; Kringelbach et al., 2008; Stein et al., 2007; Swain & Ho, 2010). The OFC shows a very rapid and specific response to infant faces and it has been suggested that this might be the brain basis for the "innate releasing mechanism" described by Lorenz (Kringelbach et al., 2008). However, it is by no means the only brain region involved in attachment, as evident from the significance of amygdala activity in attachment-related studies. Coan (2008) suggested that searching for the identification of a single attachment neural construct is like "trying to find the real artichoke by peeling away all its leaves". The attachment system most likely relies on a comprehensive neural network and no single neural construct is decisive. Indeed, given the emotion, attention, motivation, empathy, decision-making and other thinking processing involved, it has been suggested that networks of hypothalamic–midbrain–limbic–paralimbic– cortical circuits act in concert to support sensitive parenting (Swain, 2011).

Attachment and Intervention

The field of attachment, with its empirically well-placed emphasis on the environmental causes of security and insecurity, its clearly specified mechanisms of influence, and its well-developed evidence base regarding the longitudinal outcomes linked to insecurity, provides a coherent framework for intervention. In this final section, we first focus on interventions developed to promote parental sensitivity or secure infant attachment, and then turn to interventions aimed at affecting insecure adult attachment, and the role of adult attachment (of both client and therapist) in clinical process and outcome. Intervention studies in this field serve several crucial functions: first, they help establish the plasticity of attachment to environmental modification. Second, they provide highly relevant information for examining causal questions about the mechanisms driving attachment security and insecurity. Third, and most importantly, they are vital for demonstrating the potential impact and clinical value of attachment as a focus for improving outcomes for children and adults.

Parenting interventions

In light of the extensive evidence concerning the environmental determinants of early attachment and the consistent association between parenting sensitivity and attachment security, a vital question is whether early preventive interventions are effective in enhancing parental sensitivity and in doing so can they improve rates of infant attachment security. Furthermore, important secondary questions concern the type of intervention is most successful and for whom. A great deal of work has gone into the development and testing of attachment-inspired intervention or prevention programs. The interventions apparent in the literature vary widely in intensity, duration, and focus, and the relevant studies have used highly divergent outcome

measures. Some programs aim at enhancing parental sensitivity, others at affecting adult insecure attachment representations and still others at the parent-infant relationship (infant attachment). The vast majority of intervention studies have aimed to bring about change at the level of parental sensitivity and/or the level of infant-parent attachment, but a few address adult attachment as an outcome measure. We focus here on attachment-based parenting interventions and we do not include parent behavior-management interventions aimed at helping parents of children with severe behavior problems or conduct disorders (e.g., Scott & O'Connor, 2012; Webster-Stratton, Reid, & Hammond, 2004; Webster-Stratton, Rinaldi, & Reid, 2011). A meta-analysis on the effectiveness of sensitivity and attachment interventions with 81 studies (N = 7,636) on sensitivity and 29 studies (N = 1,503) on infant–parent attachment showed that randomized interventions with a focus on sensitive behavior were most effective in changing insensitive parenting (d = 0.33) as well as infant attachment insecurity (d = 0.20; Bakermans-Kranenburg, et al., 2003). The most effective interventions did not include a large number of intervention sessions with the families, and they did not necessarily start before birth or even early in life. Indeed, it was notable that interventions with up to a maximum of 16 sessions, starting 6 months after birth or later, were most effective. Surprisingly, intervention studies were generally effective regardless of the presence or absence of multiple problems in the family. It might be expected that at-risk groups would have different needs, and thus may profit from different types of interventions, particularly more intensive interventions, than lower risk or normative populations. However, in the set of multiproblem samples (30 studies, N = 4,119 families), interventions focusing on sensitivity were more effective (d = 0.48) than all other types of intervention

combined (*d* = 0.25). The most effective interventions consisted of fewer than 16 sessions.

A key finding from this meta-analytic work was that attachment insecurity emerged as being more difficult to change than maternal insensitivity. Nevertheless, the fact that sensitivity-focused interventions led to significant improvements in security, and that those studies that achieved a greater change in sensitivity (*ds* >.40) tended to yield better outcomes for the child's attachment security (*d* = .45). Interventions that were less effective in promoting sensitivity did not appear to lead to consistent changes in attachment security. Similar to intervention effects on parenting sensitivity, highly effective interventions (with a behavioral focus, i.e., improving parental sensitivity) were effective in improving attachment regardless of the presence or absence of multiple problems in the family.

For disorganized attachment, the overall effectiveness of parenting interventions was evaluated in two more recent meta-analyses (15 studies, *N* = 842) and, in marked contrast to findings regarding the impact of interventions on secure attachment, no significant overall impact of the interventions was found for disorganized attachment, *d* = 0.05 (Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2005, 2008). However, interestingly, the five intervention studies focusing on parental sensitivity were found to be effective in reducing rates of disorganized attachment (*d* = 0.26), and were significantly more effective than interventions with a different or broader focus (*d* = -0.08). This finding is intriguing as disorganized attachment has been more strongly and consistently associated with frightening and atypical parenting (e.g., Madigan, Bakermans-Kranenburg, et al., 2006) than parental sensitivity which was the focus of the effective interventions. It is possible that despite the focus on sensitivity, these interventions may also have been successful in

reducing frightening or extremely intrusive or unresponsive parental behavior, or in reducing parental dissociation by focusing parents' attention on the child's behavior (Bakermans-Kranenburg, et al., 2005). Unfortunately, thus far studies have not explicitly measured parental frightening or anomalous behavior as an outcome in order to test whether this might account for observed effects on disorganized attachment.

One of the interventions effective in reducing disorganized attachments is Video-feedback Intervention to promote Positive Parenting (VIPP, Juffer, Bakermans-Kranenburg, & van IJzendoorn, 2008) which is a short-term, home-based intervention directed at sensitive parenting behavior via video feedback. VIPP has been tested in a series of randomized control trials on a range of non-clinical and clinical samples (children with autism spectrum disorders, Poslawsky et al., in press; including samples with eating disordered mothers, A. Stein et al., 2006; children at high risk for externalizing problems, Van Zeijl et al., 2006). The main objective of VIPP is to promote the parent's sensitivity by showing and stimulating mentalization of moments of sensitive parenting of the parent in carefully selected video fragments. In a randomized control trial with early adopted children the VIPP appeared to significantly reduce rates of disorganized attachment, probably because parents had learned to mentalize their interactions with the child, reflect on their own role in the relationship, and to keep the child's attachment signals more in focus, and thus, were less distracted or dysregulated by other external or internal stimuli (Bakermans-Kranenburg, et al., 2005).

Only a few intervention programs have the explicit goal of decreasing disorganized attachments by diminishing threatening behaviors. One of them is the Attachment and Biobehavioral Catch-up (ABC) program (Bernard et al., 2012;

Dozier, et al., 2008; Dozier et al., 2006; Lewis-Morrarty, Dozier, Bernard, Terracciano, & Moore, 2012), designed as an intervention for parents of young children in foster care and for parents identified by child protective services as being at high risk of maltreating their children. Children in the ABC intervention showed significantly lower rates of disorganized attachment and higher rates of secure attachment compared to the control children (Bernard, et al., 2012). Indeed, there is increasing evidence that attachment outcomes can be improved in very high-risk families through the promotion of parental sensitivity. Targeting a group of maltreating families, a Canadian attachment-based home-visiting intervention with a behavioral focus enhanced parental sensitivity, improved children's attachment security, and reduced attachment disorganization (Moss et al., 2011; Tarabulsy et al., 2008). Inspired by the VIPP intervention, this intervention included elements identified as effective in the meta-analyses of attachment-based interventions (Bakermans-Kranenburg, et al., 2003). The intervention was brief, including eight home visits. The main focus of the intervention was parental sensitivity. The intervention sessions with video feedback were structured in a fixed order, including videotaping interactive parent-child behavior and video feedback during which the intervener played back and discussed the video fragment (see also Juffer, et al., 2008).

Additionally, a major randomized control study by Cicchetti et al. (Cicchetti, Rogosch, & Toth, 2006) has demonstrated the remarkable effectiveness of an attachment-based intervention for maltreated children and their biological parents. After going through 23 sessions of child-parent psychotherapy focusing on enhancing maternal sensitivity through maternal reinterpretation of past attachment experiences, a substantial reduction in infant disorganized attachment, and an increase in attachment security was observed for the intervention group. Interestingly, Cicchetti

and his colleagues (2011) also searched for moderators of intervention effectiveness from the perspective of differential susceptibility theory. Differential susceptibility theory suggests that individuals differ in their susceptibility to the influence of the environment, for better and for worse, and that intervention effects might be substantially underestimated when we only look at overall effects across the whole sample (Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2007; Ellis, Boyce, Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2011). Genetic markers of differential susceptibility tested in the Cicchetti et al. (2011) intervention were dopamine- and serotonin-system related genes. However, they did not find significant genetic moderation of the treatment effect. One might speculate that genetic moderation was absent because the effects of the environment on disorganized attachment overrode the influence of any genetic component. It may be that differential susceptibility to the environment operates within certain environmental margins, beyond which they are overwhelmed (e.g., maltreating families, orphanages) or remediated as a result of major transitions to vastly improved environments (e.g. through intervention, foster care or adoption).

The Bucharest Early Intervention Project (BEIP; Drury et al., 2012), however, seems to disconfirm this latter interpretation. In this unique randomized control trial 2-year old children growing up in Romanian orphanages were pretested with the Disturbances of Attachment Interview for levels of disorganized and disturbed attachments and indiscriminate friendliness, and subsequently randomly assigned to either care as usual or high quality foster care. The children were genotyped for the Brain Derived Neurotrophic Factor (BDNF) SNP and the serotonin transporter Variable Number Tandem Repeat (5HTTLPR). The post-test at 54 months showed that children with the short 5HTTLPR alleles or met66 BDNF genotype displayed

lowest levels of indiscriminate friendliness at post-test and highest levels at pretest. Their peers without the susceptibility genotypes did not change their indiscriminate friendliness as a consequence of the foster care, a clear demonstration of differential susceptibility (Drury, et al., 2012). This study illustrates the importance of considering risk modifiers or differential susceptibility markers in treatment outcome studies, both at the genetic, biological and social level.

It is remarkable to note the similarities in the results of the meta-analyses addressing maternal sensitivity, attachment security, and attachment disorganization. They all provide evidence for the "less is more" adage: interventions with a focus on parenting sensitivity turn out to be most successful. A focused approach, centering an intervention on a small set of well-defined targets, is also clearly preferable from a methodological perspective as well (van IJzendoorn et al., 2005). Broadband interventions may be very effective on certain outcome measures but it may remain unclear which ingredients are responsible for the effects. A piecemeal approach to constructing effective interventions, starting with testing the effectiveness of small building blocks or intervention modules that, after successful evaluations, can be combined into an even more effective overall program can produce more unambiguous insights than beginning with a complex multimodal intervention. Also, the modular approach might suit the differing needs of clients and services more efficiently, because it allows for a stepped-care approach in which a single intervention module is deployed to address the most common and least complex problems, and additional modules are added in more severe cases, or when earlier intervention efforts do not bear fruit.

Taking into account the enormous effort that goes into planning and conducting an intervention study, meta-analysis offers an indispensable tool for

identifying generalizable, effective, interventions and to facilitate evidence-based decision-making in the public health arena. It is therefore remarkable that the Triple-P program (Sanders, Markie-Dadds, & Turner, 2003) has been used on a whole-population basis as a public health intervention and enjoys adoption at a large scale across the world, with substantial cost implications, notwithstanding a lack of randomized controlled studies showing its effectiveness. A recent meta-analysis showed no between-group differences for studies with an adequate control group, and substantial selective reporting bias (Wilson et al., 2012). Interestingly, 32 of the 33 eligible studies were authored by Triple-P affiliated personnel (Wilson, et al., 2012) – meta-analysis uncovers telling details.

Holding and Trauma Therapies

So called "attachment therapy" and similar approaches such as "holding" or "trauma therapy" have received a great deal of public attention and enjoy considerable popularity on numerous internet sites for parents of troubled children. The American Professional Society on the Abuse of Children (APSAC) Task Force published an important report on the controversial "attachment therapies" provided to maltreated children and their biological, foster, or adoptive parents (Chaffin et al., 2006). In some cases such therapies have already proven to be harmful for children. In holding therapy, children are forced to make physical contact with their parent or other caregivers although they strongly resist these attempts. Physical force may even be used to reach the goal of proximity. The child would thus, according to this way of thinking, be enabled to regress to an earlier stage of bonding, and the re-experience of this crucial stage would stimulate the re-construction of a secure attachment relationship. Holding therapy however has not been proven to be effective, and might even be dangerous (Chaffin et al., 2006; O'Connor & Zeanah, 2003; Sroufe, Erickson,

& Friedrich, 2002). In fact, holding therapy is not implied at all by attachment theory. Therapists force the parent or caregiver to be extremely insensitive and to ignore clear signs from the child not wanting physical contact. At the core of sensitive parenting is the careful reading of children's attachment signals and needs, and to respond promptly and adequately to those signals (Ainsworth, Blehar, Waters, & Wall, 1978b). Holding therapy may well encourage the antithesis of sensitive care (Cyr, et al., 2010).

Adult attachment and reflective functioning in interventions

As noted earlier, evidence suggests that it may be more difficult to change insecure adult attachment representations than it is to enhance infant attachment security or parental sensitivity (Korfmacher, Adam, Ogawa, & Egeland, 1997; van IJzendoorn, Juffer, & Duyvesteyn, 1995), particularly in clinical samples. Nevertheless, there is evidence that effective change can be achieved. Stovall-McClough and Cloitre (2003), working with women with PTSD following a history of childhood sexual abuse, with high rates of unresolved trauma, showed that unresolved AAI attachment status was most strongly associated with PTSD avoidant symptoms, and used imaginal exposure therapy to address the avoidant symptoms. The treatment appeared effective, not just for PTSD but also for unresolved loss. They observed a 62% reduction in unresolved attachment and absence of PTSD diagnosis for women in the exposure group. In a randomized trial with 90 Borderline Personality Disorder patients, Levy and colleagues (Levy, Beeney, & Temes, 2011) showed the effectiveness of one of the intervention modalities on changing attachment representations. Patients were assigned to one of three types of therapy, transference-focused psychotherapy (TFP), dialectical behavior therapy (DBT), or a modified psychodynamic supportive psychotherapy (SPT). The primary goal of TFP

is to reduce symptomatology and self-destructive behavior through the modification of representations of self and others as they are enacted in the treatment. During the first year of treatment, TFP focuses on the identification of dominant relational patterns as they are experienced and expressed in the transference relationship. Based on the AAI the representation of attachment was classified and Reflective Functioning (RF) was coded. After 12 months of treatment, TFP participants showed a significant increase in secure classifications and RF that was absent for the other two treatments. However, no changes in resolution of loss or trauma were observed across treatments. Toth and colleagues (Toth, Rogosch, & Cicchetti, 2008; Toth, Rogosch, Manly, & Cicchetti, 2006) administered the AAI before and after parent-child psychotherapy in a sample of mothers with major depressive disorder and their young children. The randomized controlled trial included a depressed control group and a non-depressed control group. After treatment, mothers in the depressed group showed a significant increase in RF in the AAI, as well as more positive relationships with their children.

The social-cognitive and affective concept of mentalization has become increasingly important to theory in clinical treatment in general, and psychoanalysis in particular. RF was first described by Fonagy, Steele, Steele, Moran, and Higgit (1991) as the ability to put oneself in another's shoes and to think about the thoughts, feelings, and intentions that may guide or have guided the other's behavior. The concept of RF arose out of the AAI state of mind scale metacognition, defined as monitoring and correcting one's own speech and thoughts during the interview (Main, et al., 2003). RF expresses itself in response to AAI questions that demand reflection by asking "why" questions (Steele, Steele, & Murphy, 2009), such as: "Why do you think your parents behaved as they did during your childhood?" Fonagy and colleagues coined the term mentalization (Fonagy, Gergely, Jurist, & Target, 2002;

Fonagy & Target, 1996, 2006) to describe the capacity to interpret or make sense of behavior in oneself and others in terms of intentional mental states such as thoughts, feelings, and beliefs. Thus, mentalization is the capacity to evoke and reflect on one's own experience to make inferences about behavior in oneself and others. RF has been operationalized to evaluate the quality of mentalization in the context of attachment relationships, and has been used as an outcome measure in several randomized controlled trials (see above). It is related to such concepts as insight, intraception, and self-observing capacities of the ego, mindfulness, and mind-mindedness.

Although the concept of reflective functioning is broadly embraced (e.g., it has been argued that in the treatment of narcissism increasing self-reflective functioning is crucial to recovery, Bennett, 2006), it has also been noted that its validity and stability as an outcome measure are uncertain because adequate reports on its test-retest reliability and convergent and discriminant validity are absent (Choi-Kain & Gunderson, 2008). Moreover, it may be that individuals vary in their reflective functioning depending on who he or she is mentalizing about (Choi-Kain & Gunderson, 2008). Indeed, the RF scale has been used with a variety of interviews and that may in part be responsible for the relatively fuzzy boundaries of the concept and difficulties in the assessment. Nevertheless, the introduction of the concepts of mentalizing and reflective functioning was a catalyst for the development of a range of novel and potentially effective treatments, in particular for patients with BPD.

Attachment fit between client and therapist.

The attachment representations of both patients and clinicians may play a role in the process and outcome of treatment. Dozier (1990) reported that individuals with a more dismissing stance to attachment were less likely to disclose symptomatology, more likely to minimize the interventions of case managers, and less likely to engage

with treatment. In an intervention study involving mothers with an insecure attachment representation, dismissing mothers did not profit from discussion about attachment issues, and tended to view four home-based intervention sessions as requiring too much time investment from them (Bakermans-Kranenburg, Juffer, & van IJzendoorn, 1998). They were evaluated as less invested than other mothers in an intervention focusing on parenting sensitivity (Korfmacher, et al., 1997). Adult attachment style has also been found to relate to adolescent's approach to treatment, with preoccupied adolescents in a residential treatment program showing the highest levels of truancy, rule breaking, and externalizing behavior problems (Zegers, Schuengel, van IJzendoorn, & Janssens, 2008).

Process research in psychoanalysis and psychoanalytic psychotherapy has indicated various factors that are related to positive treatment outcome. Patient–therapist fit is a factor that is generally indicated as predictive of treatment success (Fonagy et al., 1996; Kantrowitz, 1993; Stolk et al., 2008), but evidently there may be a wide variety of models of what is meant by 'fit'. Both interpersonal theory and attachment theory suggest that a central task of the therapist is to resist the tendency to respond to the client's interpersonal or attachment orientation in a complementary manner, so as not to reinforce the client's rigid way of approaching relationships (Bernier & Dozier, 2002). Providing the client with a contrasting relational orientation appears to be beneficial in psychotherapy (Andrews, 1991), case management (Tyrrell, et al., 1999), and academic counseling (Larose & Bernier, 2001), and indeed the corrective emotional experience may be a key factor in therapeutic change. Bowlby (1988) suggested that the therapist should help the client recognize and change insecure working models or maladaptive relational patterns. He proposed that the therapist should challenge the client's beliefs about relationships by flexibly

adopting a stance that is in contrast to the client's expectations. It is not far-fetched to argue that for a therapist with a secure representation of attachment it will be easier to respond in a contrasting (noncomplementary) way to the client's relational orientation than for an insecure therapist. In support of this idea Dozier, Cue, and Barnett (1994) have shown that clinicians with an autonomous AAI were more effective at providing noncomplementary responses than were nonautonomous clinicians. That is, autonomous clinicians worked in greater depth with clients presenting dismissing features than with preoccupied clients, whereas nonautonomous clinicians provided complementary responses, working in greater depth with preoccupied clients. This may explain why Gerber, Fonagy and their colleagues (Gerber, Fonagy, Bateman, & Higgitt, 2004), in a quasi-experimental trial of psychoanalysis and psychoanalytic psychotherapy, found that patients who became progressively more insecure on the AAI in the first phase of treatment were significantly more likely to improve in terms of their symptomatology by termination (Gerber et al., 2004): these patients may have been challenged to take a stance contrasting with their previous representation, temporarily leading to more insecurity or even less organization of attachment representation, which led to a better outcome in the end. If this line of reasoning is correct, then therapists' own tendencies to more dismissing or more preoccupied representations within the range of security may play a facilitating or impeding role in treatment, depending on the client's attachment representation. Consistent with this idea, clients and therapists showing dissimilar attachment tendencies on the dismissing–preoccupied dimension were shown to have better alliances and more productive relationships (Tyrrell, et al., 1999). In such dyads, the natural style of the therapist appears to make him or her more likely to adopt an interpersonal stance that

is contrary to what the client "pulls for", thereby disconfirming the client's rigid perceptions and strategies (Bernier & Dozier, 2002).

It should however be noted that the vast majority of the therapists in the Tyrrell et al. (1999) study were rated as autonomous based on a modified version of the Attachment Q Set (Kobak, 1989). Direct comparison with AAI classifications of the mentors in the adolescents' residential treatment institution of the Zegers et al. (2008) study is thus not possible, but the 55% of autonomous mentors in that study– although similar to the norm distribution – is considerably less than those in the Tyrrell study. At 3 months into treatment, no difference in therapeutic relationships between adolescents and secure versus insecure mentors could be traced, but between 3 and 10 months into treatment, the psychological availability of nonautonomous mentors decreased in the perception of the adolescents, whereas the perceived psychological availability of autonomous mentors increased. Similarly, reliance on autonomous mentors increased between 3 and 10 months, but reliance on nonautonomous mentors decreased over time (Zegers, Schuengel, van IJzendoorn, & Janssens, 2006).

The AAI can also be part of the intake and treatment process. As an interview it goes beyond available screening instruments by tapping into experiences in the family of origin, and it also opens up the perceived state of mind of the individual with respect to these experiences, including experiences of loss and other trauma. When multiple losses or abusive events are presented, it is informative which experiences are reported in a coherent way, and when disorganized speech, indicative of unresolved loss or trauma, takes over (Steele, et al., 2009). Who should administer the AAI in the therapeutic context, and when should the interview take place? Steele and colleagues (2009) advise that the AAI be administered early in the treatment by

the clinician himself or herself, unless the fragility of the patient would ask for postponement until a therapeutic alliance is in place. They argue that in other cases the AAI is likely to promote alliance. Over time, it is expected that content from the interview will filter through material covered in the course of the therapy (Steele et al., 2009).

In sum, secure adult attachment representations and associated mentalizing competence can be stimulated by therapeutic interventions although the evidence-base still is disappointingly small. Psychotherapy is about creating more coherent autobiographical narratives (Bowlby, 1988), which implies a shift from preoccupied or dismissing representations of the past to more balanced, open and coherent discourse from a mentalizing stance. Some of the most promising attachment-related psychotherapy studies show that attachment representations of client *and* therapist might help us understand why some client-therapist combinations are more effective than others. It is not the perfect match but a mild mismatch of counterbalancing representational biases that might be most productive in creating positive change.

CONCLUSIONS

Attachment theory and research has had a major impact on thinking regarding the developmental mechanisms contributing to adaptation and risk for psychological disorder. Its contribution to the field has occurred at a number of levels. First, it pioneered, in many respects, the developmental approach to understanding psychopathology, particularly its treatment of the connections between levels of analysis – the evolutionary, biological, cognitive/affective and relational – and their unfolding interactions and transformations across development. Second, the field has revealed a host of rich phenomena relevant to understanding psychopathology, and

worthy of serious scientific and clinical investigation: protest, despair, detachment, secure base behavior, avoidance, resistance, disorganization, sensitivity of care, frightened/frightening parenting, coherence of mind, lack of resolution or mourning or trauma, to name some of the most prominent. Third, the field has established a strong evidence base supporting its major tenets, most notably 1) the environmental origins of individual differences in attachment security and insecurity, 2) the important predictive, and likely causal, role of parental sensitivity, 3) the long-term developmental disadvantages associated with insecure attachment in the domains of internalizing problems, externalizing problems and social competence, 4) the intergenerational transmission of patterns of attachment. In the process of establishing this evidence base, attachment research has also highlighted the limits of the attachment construct, at least as currently measured and conceptualized, the role of important moderators in modifying or qualifying its effects, and the potentially complex developmental pathways by which attachment is connected to later outcomes. Finally, and perhaps most importantly, the field has developed a range of approaches to intervention and prevention that are delivering reliable positive outcomes for children and families.

References

Abrams, K. Y., Rifkin, A., & Hesse, E. (2006). Examining the role of parental frightened/frightening subtypes in predicting disorganized attachment within a brief observational procedure. *Development and Psychopathology, 18*(2), 345-361. doi: http://dx.doi.org/10.1017/S0954579406060184

Achenbach, T. M. (1991). *Manual for Teacher's Report Form and 1991 Profile*. Burlington, VT: University of Vermont Department of Psychiatry.

Achenbach, T. M., Edelbrock, C., & Howell, C. T. (1987). Empirically based assessment of the behavioral/emotional problems of 2- and 3-year-old children. *Journal of Abnormal Child Psychology, 15*(4), 629-650. doi: http://dx.doi.org/10.1007/BF00917246

Adam, K. S., Sheldon-Keller, A. E., & West, M. (1996). Attachment organization and history of suicidal behavior in clinical adolescents. *Journal of Consulting and Clinical Psychology, 64*(2), 264-272. doi: http://dx.doi.org/10.1037/0022-006X.64.2.264

Ahnert, L., Gunnar, M. R., Lamb, M. E., & Barthel, M. (2004). Transition to Child Care: Associations With Infant-Mother Attachment, Infant Negative Emotion, and Cortisol Elevations. *Child Development, 75*(3), 639-650. doi: http://dx.doi.org/10.1111/j.1467-8624.2004.00698.x

Ainsworth, M. D. S. (1967). *Infancy in Uganda: Infant care and the growth of attachment*. Baltimore, MD: The Johns Hopkins Press.

Ainsworth, M. D. S. (1972). Attachment and dependency: A comparison *Gewirtz, Jacob L (1972) Attachment and dependency x, 251 pp Oxford, England: V H Winston & Sons; England*.

Ainsworth, M. D. S., & Bell, S. (1974). Mother-infant interaction and the development of competence. In C. Connolly & J. Bruner (Eds.), *The growth of competence* (pp. 97-118). New York: Academic Press.

Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978a). *Patterns of attachment: A psychological study of the strange situation* (Vol. xviii). Hillsdale, NJ: Lawrence Erlbaum.

Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978b). Patterns of attachment: A psychological study of the strange situation. *391*.

Ainsworth, M. D. S., & Wittig, B. A. (1969). Attachment and exploratory behavior of one-year-olds in a strange situation. In B.M.Foss (Ed.), *Determinants of infant behavior* (pp. 113-136). London: Methuen.

Allen, J. P., McElhaney, K. B., Kuperminc, G. P., & Jodl, K. M. (2004). Stability and Change in Attachment Security Across Adolescence. *Child Development, 75*(6), 1792-1805. doi: http://dx.doi.org/10.1111/j.1467-8624.2004.00817.x

Ammaniti, M., Speranza, A. M., & Candelori, C. (1996). Stabilita dell'attaccamento infantile e transmissione intergenerazionale dell'attaccamento [Stability of infant attachement and intergenerational transmission of attachment]. *Psichiatria dell'Infanzia e dell'Adolescenza, 63*, 313–332.

Andrews, J. D. W. (1991). *The active self in psychotherapy: An integration of therapeutic styles*. New York: Gardner.

Arend, R., Gove, F. L., & Sroufe, L. A. (1979). Continuity of individual adaptation from infancy to kindergarten: A predictive study of ego-resiliency and curiosity in preschoolers. *Child Development, 50*(4), 950-959. doi: http://dx.doi.org/10.2307/1129319

Arranz, E., Artamendi, J., Olabarrieta, F., & Martin, J. (2002). Family context and theory of mind development. *Early Child Development and Care, 172*(1), 9-22. doi: http://dx.doi.org/10.1080/03004430210880

Astington, J. W. (2003). Sometimes necessary, never sufficient: False-belief understanding and social competence *Individual differences in theory of mind: Implications for typical and atypical development* (pp. 13-38). New York, NY: Psychology Press; US.

Atkinson, L., Goldberg, S., Raval, V., Pederson, D., Benoit, D., Moran, G., . . . Leung, E. (2005). On the Relation Between Maternal State of Mind and

Sensitivity in the Prediction of Infant Attachment Security. *Developmental Psychology, 41*(1), 42-53. doi: http://dx.doi.org/10.1037/0012-1649.41.1.42

Atzil, S., Hendler, T., & Feldman, R. (2011). Specifying the neurobiological basis of human attachment: Brain, hormones, and behavior in synchronous and intrusive mothers. *Neuropsychopharmacology, 36*(13), 2603-2615. doi: http://dx.doi.org/10.1038/npp.2011.172

Aviezer, O., Sagi, A., Resnick, G., & Gini, M. (2002). School competence in young adolescence: Links to early attachment relationships beyond concurrent self-perceived competence and representations of relationships. *International Journal of Behavioral Development, 26*(5), 397-409. doi: http://dx.doi.org/10.1080/01650250143000328

Avinun, R., & Knafo, A. (2013). Parenting as a Reaction Evoked by Children's Genotype: A Meta-Analysis of Children-as-Twins Studies. *Personality and Social Psychology Review, 12,* 1-16. doi: 10.1177/1088868313498308

Bakermans- Kranenburg, M. J., & van IJzendoorn, M. H. (2004). No association of the dopamine D4 receptor (DRD4) and -521 C/T promoter polymorphisms with infant attachment disorganization. *Attachment & Human Development, 6*(3), 211-218. doi: http://dx.doi.org/10.1080/14616730412331281584

Bakermans-Kranenburg, M. J., Juffer, F., & van IJzendoorn, M. H. (1998). Interventions with video feedback and attachment discussions: Does type of maternal insecurity make a difference? *Infant Mental Health Journal, 19*(2), 202-219. doi: http://dx.doi.org/10.1002/%28SICI%291097-0355%28199822%2919:2%3C202::AID-IMHJ8%3E3.0.CO;2-P

Bakermans-Kranenburg, M. J., Sonuga-Barke, E. J., Bos, K., Bunkers, K. M., Dobrova-Krol, N. A., Engle, P. L., . . . Grotevant, H. D. (2011). Children

without permanent parents: Research, practice, and policy: Abstract. *Monographs of the Society for Research in Child Development, 76*(4), 1-11. doi: http://dx.doi.org/10.1111/j.1540-5834.2011.00624.x

Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2007). Research review: Genetic vulnerability or differential susceptibility in child development: The case of attachment. *Journal of Child Psychology and Psychiatry, 48*(12), 1160-1173. doi: http://dx.doi.org//10.1111/j.1469-7610.2007.01801.x

Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2009). The first 10,000 adult attachment interviews: Distributions of adult attachment representations in clinical and non-clinical groups. *Attachment & Human Development, 11*(3), 223-263. doi: http://dx.doi.org/10.1080/14616730902814762

Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., & Juffer, F. (2003). Less is more: Meta-analyses of sensitivity and attachment interventions in early childhood. *Psychological Bulletin, 129*(2), 195-215. doi: http://dx.doi.org/10.1037/0033-2909.129.2.195

Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., & Juffer, F. (2005). Disorganized Infant Attachment and Preventive Interventions: A Review and Meta-Analysis. *Infant Mental Health Journal, 26*(3), 191-216. doi: http://dx.doi.org/10.1002/imhj.20046

Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., & Juffer, F. (2008). Earlier is better: A meta-analysis of 70 years of intervention improving cognitive development in institutionalized children. *Monographs of the Society for Research in Child Development, 73*(3), 279-293. doi: http://dx.doi.org/10.1111/j.1540-5834.2008.00498.x

Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Pijlman, F. T., Mesman, J., & Juffer, F. (2008). Experimental evidence for differential susceptibility: Dopamine D4 receptor polymorphism (DRD4 VNTR) moderates intervention effects on toddlers' externalizing behavior in a randomized controlled trial. *Developmental Psychology, 44*(1), 293-300. doi: http://dx.doi.org/10.1037/0012-1649.44.1.293

Banks, S. J., Eddy, K. T., Angstadt, M., Nathan, P. J., & Phan, K. (2007). Amygdala-frontal connectivity during emotion regulation. *Social Cognitive and Affective Neuroscience, 2*(4), 303-312. doi: http://dx.doi.org/10.1093/scan/nsm029

Barone, L., & Lionetti, F. (2012). Attachment and social competence: A study using MCAST in low-risk Italian preschoolers. *Attachment & Human Development, 14*(4), 391-403. doi: http://dx.doi.org/10.1080/14616734.2012.691653

Barry, R. A., Kochanska, G., & Philibert, R. A. (2008). GxE interaction in the organization of attachment: Mothers' responsiveness as a moderator of children's genotypes. *Journal of Child Psychology and Psychiatry, 49*(12), 1313-1320. doi: http://dx.doi.org/10.1111/j.1469-7610.2008.01935.x

Bartholomew, K., & Horowitz, L. M. (1991). Attachment styles among young adults: A test of a four-category model. *Journal of Personality and Social Psychology, 61*(2), 226-244. doi: http://dx.doi.org/10.1037/0022-3514.61.2.226

Bates, J. E., Maslin, C. A., & Frankel, K. A. (1985). Attachment security, mother-child interaction, and temperament as predictors of behavior-problem ratings at age three years. *Monographs of the Society for Research in Child Development, 50*(1-2), 167-193. doi: http://dx.doi.org/10.2307/3333832

Beijersbergen, M. D., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., & Juffer, F. (2008). Stress regulation in adolescents: Physiological reactivity during the Adult Attachment Interview and conflict interaction. *Child Development, 79*(6), 1707-1720. doi: http://dx.doi.org/10.1111/j.1467-8624.2008.01220.x

Beijersbergen, M. D., Juffer, F., Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2012). Remaining or becoming secure: Parental sensitive support predicts attachment continuity from infancy to adolescence in a longitudinal adoption study. *Developmental Psychology, 48*(5), 1277-1282. doi: http://dx.doi.org/10.1037/a0027442

Belsky, J. (1996). Parent, infant, and social-contextual antecedents of father-son attachment security. *Developmental Psychology, 32*(5), 905-913. doi: http://dx.doi.org/10.1037/0012-1649.32.5.905

Belsky, J., Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2007). For better and for worse: Differential susceptibility to environmental influences. *Current Directions in Psychological Science, 16*(6), 300-304. doi: http://dx.doi.org/10.1111/j.1467-8721.2007.00525.x

Belsky, J., Campbell, S. B., Cohn, J. F., & Moore, G. (1996). Instability of infant-parent attachment security. *Developmental Psychology, 32*(5), 921-924. doi: http://dx.doi.org/10.1037/0012-1649.32.5.921

Belsky, J., & Fearon, R. (2002). Infant-mother attachment security, contextual risk, and early development: A moderational analysis. *Development and Psychopathology, 14*(2), 293-310. doi: http://dx.doi.org/10.1017/S0954579402002067

Belsky, J., & Fearon, R. M. P. (2002). Early attachment security, subsequent maternal sensitivity, and later child development: does continuity in development depend upon continuity of caregiving? *Attachment & human development, 4*(3), 361-387. doi: 10.1080/14616730210167267

Belsky, J., & Fearon, R. M. P. (2008). Precursors of attachment security *Handbook of attachment: Theory, research, and clinical applications* (2nd ed., pp. 295-316). New York, NY: Guilford Press; US.

Belsky, J., Fearon, R. P., & Bell, B. (2007). Parenting, attention and externalizing problems: Testing mediation longitudinally, repeatedly and reciprocally. *Journal of Child Psychology and Psychiatry, 48*(12), 1233-1242. doi: http://dx.doi.org/10.1111/j.1469-7610.2007.01807.x

Bennett, C. (2006). Attachment theory and research applied to the conceptualization and treatment of pathological narcissism. *Clinical Social Work Journal, 34*(1), 45-60. doi: http://dx.doi.org/10.1007/s10615-005-0001-9

Berlin, L. J., & Cassidy, J. (2003). Mothers' Self-Reported Control of Their Preschool Children's Emotional Expressiveness: A Longitudinal Study of Associations with Infant-Mother Attachment and Children's Emotion Regulation. *Social Development, 12*(4), 477-495. doi: http://dx.doi.org/10.1111/1467-9507.00244

Berlin, L. J., Cassidy, J., & Appleyard, K. (2008). The influence of early attachments on other relationships *Handbook of attachment: Theory, research, and clinical applications* (2nd ed., pp. 333-347). New York, NY: Guilford Press; US.

Bernard, K., & Dozier, M. (2010). Examining infants' cortisol responses to laboratory tasks among children varying in attachment disorganization: Stress reactivity or return to baseline? *Developmental Psychology, 46*(6), 1771-1778. doi: http://dx.doi.org/10.1037/a0020660

Bernard, K., Dozier, M., Bick, J., Lewis-Morrarty, E., Lindhiem, O., & Carlson, E. (2012). Enhancing attachment organization among maltreated children: Results of a randomized clinical trial. *Child Development, 83*(2), 623-636.

Bernier, A., & Dozier, M. (2002). The client-counselor match and the corrective emotional experience: Evidence from interpersonal and attachment research. *Psychotherapy: Theory, Research, Practice, Training, 39*(1), 32-43. doi: http://dx.doi.org/10.1037/0033-3204.39.1.32

Blake, D. D., Weathers, F. W., Nagy, L. M., Kaloupek, D. G., Klauminser, G., & Charney, D. S. (1998). *Clinician-administered PTSD scale for DSM-IV*. Boston: National Center for Posttraumatic Stress Disorder-Behavioral Science Division.

Blatz, W. (1966). *Human security: Some reflections*. Oxford, England: Toronto Press.

Bohlin, G., Hagekull, B., & Rydell, A.-M. (2000). Attachment and social functioning: A longitudinal study from infancy to middle childhood. *Social Development, 9*(1), 24-39. doi: http://dx.doi.org/10.1111/1467-9507.00109

Bokhorst, C. L., Bakermans-Kranenburg, M. J., Fearon, R., van IJzendoorn, M. H., Fonagy, P., & Schuengel, C. (2003). The importance of shared environment in mother-infant attachment security: A behavioral genetic study. *Child Development, 74*(6), 1769-1782. doi: http://dx.doi.org/10.1046/j.1467-8624.2003.00637.x

Booth-LaForce, C., Groh, A. M., Burchinal, M. R., Roisman, G. I., Owen, M. T., & Cox, M. J. (in press). Caregiving and contextual sources of continuity and change in attachment security from infancy to late adolescence. In C. Booth-LaForce & G. I. Roisman (Eds.), *The Adult Attachment Interview:*

Psychometrics, stability and change from infancy, and developmental origins. Monographs of the Society for Research in Child Development.

Borelli, J. L., Goshin, L., Joestl, S., Clark, J., & Byrne, M. W. (2010). Attachment organization in a sample of incarcerated mothers: Distribution of classifications and associations with substance abuse history, depressive symptoms, perceptions of parenting competency and social support. *Attachment & Human Development, 12*(4), 355-374. doi: http://dx.doi.org/10.1080/14616730903416971

Bos, P. A., Panksepp, J., Bluthe, R. M., & van Honk, J. (2012). Acute effects of steroid hormones and neuropeptides on human social-emotional behavior: a review of single administration studies. *Front Neuroendocrinol, 33*(1), 17-35. doi: 10.1016/j.yfrne.2011.01.002

Bost, K. K., Shin, N., McBride, B. A., Brown, G. L., Vaughn, B. E., Coppola, G., . . . Korth, B. (2006). Maternal secure base scripts, children's attachment security, and mother-child narrative styles. *Attachment & Human Development, 8*(3), 241-260. doi: http://dx.doi.org/10.1080/14616730600856131

Bowlby, J. (1944). Fourty-four juvenile theives: Their characters and home life. *International Journal of Psycho-Analysis, 25*, 19-52.

Bowlby, J. (1969). *Attachment and Loss, Vol. 1: Attachment*. London: Hogarth Press and the Institute of Psycho-Analysis.

Bowlby, J. (1973). *Attachment and Loss, Vol. 2: Separation: Anxiety and Anger*. London: Hogarth Press and Institute of Psycho-Analysis.

Bowlby, J. (1980). *Attachment and Loss, Vol. 3: Loss: Sadness and Depression*. London: Hogarth Press and Institute of Psycho-Analysis.

Bowlby, J. (1988). *A Secure Base: Clinical Applications of Attachment Theory*. London: Routledge.

Bowlby, J., Robertson, J., & Rosenbluth, D. (1952). A two-year-old goes to the hospital. In R. S. Eisler, A. Freud, H. Hartmann & E. Kris (Eds.), *Psychoanaltyic Study of the Child*. New York: International Universities Press.

Bretherton, I. (1990). Communication patterns, internal working models, and the intergenerational transmission of attachment relationships. *Infant Mental Health Journal, 11*(3), 237-252. doi: http://dx.doi.org/10.1002/1097-0355%28199023%2911:3%3C237::AID-IMHJ2280110306%3E3.0.CO;2-X

Bretherton, I. (1992). The origins of attachment theory: John Bowlby and Mary Ainsworth. *Developmental Psychology, 28*(5), 759-775. doi: http://dx.doi.org/10.1037/0012-1649.28.5.759

Bretherton, I. (1995). A communication perspective on attachment relationships and internal working models. *Monographs of the Society for Research in Child Development, 60*(2-3), 310-329. doi: http://dx.doi.org/10.2307/1166187

Bretherton, I. (2005). In Pursuit of the Internal Working Model Construct and Its Relevance to Attachment Relationships *Attachment from infancy to adulthood: The major longitudinal studies* (pp. 13-47). New York, NY: Guilford Publications; US.

Bretherton, I., & Munholland, K. A. (2008). Internal working models in attachment relationships: Elaborating a central construct in attachment theory *Handbook of attachment: Theory, research, and clinical applications* (2nd ed., pp. 102-127). New York, NY: Guilford Press; US.

Bretherton, I., & Oppenheim, D. (2003). The MacArthur Story Stem Battery: Development, directions for administration, reliability, validity and reflections

about meaning. In R. N. Emde, D. P. Wolf & D. Oppenheim (Eds.), *Revealing the inner worlds of young children: The MacArthur Story Stem Battery and parent-child narratives* (pp. 55-80). New York: Oxford University Press.

Bretherton, I., Ridgeway, D., & Cassidy, J. (1990). Assessing internal working models of the attachment relationship: An attachment story completion task for 3-year-olds *Attachment in the preschool years: Theory, research, and intervention* (pp. 273-308). Chicago, IL: University of Chicago Press; US.

Brown, G. L., Mangelsdorf, S. C., & Neff, C. (2012). Father involvement, paternal sensitivity, and father-child attachment security in the first 3 years. *Journal of Family Psychology, 26*(3), 421-430. doi: http://dx.doi.org/10.1037/a0027836

Brussoni, M. J., Jang, K. L., Livesley, W., & MacBeth, T. M. (2000). Genetic and environmental influences on adult attachment styles. *Personal Relationships, 7*(3), 283-289. doi: http://dx.doi.org/10.1111/j.1475-6811.2000.tb00017.x

Buchheim, A., Erk, S., George, C., Kachele, H., Ruchsow, M., Spitzer, M., . . . Walter, H. (2006). Measuring Attachment Representation in an fMRI Environment: A Pilot Study. *Psychopathology, 39*(3), 144-152. doi: http://dx.doi.org/10.1159/000091800

Burgess, K. B., Marshall, P. J., Rubin, K. H., & Fox, N. A. (2003). Infant attachment and temperament as predictors of subsequent externalizing problems and cardiac physiology. *Journal of Child Psychology and Psychiatry, 44*(6), 819-831. doi: http://dx.doi.org/10.1111/1469-7610.00167

Cairns, R. B. (1972). Attachment and dependency: A psychobiological and social-learning synthesis *Gewirtz, Jacob L (1972) Attachment and dependency x, 251 pp Oxford, England: V H Winston & Sons; England*.

Calkins, S. D., & Fox, N. A. (1992). The relations among infant temperament, security of attachment, and behavioral inhibition at twenty-four months. *Child Development, 63*(6), 1456-1472. doi: http://dx.doi.org/10.2307/1131568

Carlson, E. A. (1998). A prospective longitudinal study of attachment disorganization/disorientation. *Child Development, 69*(4), 1107-1128. doi: http://dx.doi.org/10.2307/1132365

Caspi, A., Sugden, K., Moffitt, T. E., Taylor, A., Craig, I. W., Harrington, H., . . . Poulton, R. (2003). Influence of life stress on depression: Moderation by a polymorphism in the 5-HTT gene. *Science, 301*(5631), 386-389. doi: http://dx.doi.org/10.1126/science.1083968

Cassidy, J. (1994). Emotion regulation: Influences of attachment relationships. *Monographs of the Society for Research in Child Development, 59*(2-3), 228-283. doi: http://dx.doi.org/10.2307/1166148

Cassidy, J., & Berlin, L. J. (1994). The insecure/ambivalent pattern of attachment: Theory and research. *Child Development, 65*(4), 971-981. doi: http://dx.doi.org/10.2307/1131298

Cassidy, J., Kirsh, S. J., Scolton, K. L., & Parke, R. D. (1996). Attachment and representations of peer relationships. *Developmental Psychology, 32*(5), 892-904. doi: http://dx.doi.org/10.1037/0012-1649.32.5.892

Cassidy, J., Marvin, R. S., & The MacArthur Working Group on Attachment. (1992). *Attachment organization in preschool children: Coding guidelines* (4th ed.): Unpublished manuscript, University of Virginia.

Cassidy, J., Woodhouse, S. S., Sherman, L. J., Stupica, B., & Lejuez, C. (2011). Enhancing infant attachment security: An examination of treatment efficacy

and differential susceptibility. *Development and Psychopathology, 23*(1), 131-148. doi: http://dx.doi.org/10.1017/S0954579410000696

Chaffin, M., Hanson, R., Saunders, B. E., Nichols, T., Barnett, D., Zeanah, C., . . . Miller-Perrin, C. (2006). Report of the APSAC Task Force on Attachment Therapy, Reactive Attachment Disorder, and Attachment Problems. *Child Maltreatment, 11*(1), 76-89. doi: http://dx.doi.org/10.1177/1077559505283699

Chaplin, T. M., & Cole, P. M. (2005). The Role of Emotion Regulation in the Development of Psychopathology *Development of psychopathology: A vulnerability-stress perspective* (pp. 49-74). Thousand Oaks, CA: Sage Publications, Inc; US.

Choi-Kain, L. W., & Gunderson, J. G. (2008). Mentalization: Ontogeny, assessment, and application in the treatment of borderline personality disorder. *The American Journal of Psychiatry, 165*(9), 1127-1135. doi: http://dx.doi.org/10.1176/appi.ajp.2008.07081360

Cicchetti, D. (1984). The emergence of developmental psychopathology. *Child Development, 55*(1), 1-7. doi: http://dx.doi.org/10.2307/1129830

Cicchetti, D., & Cohen, D. J. (1995). Perspectives on developmental psychopathology *Developmental psychopathology, Vol 1: Theory and methods* (pp. 3-20). Oxford, England: John Wiley & Sons; England.

Cicchetti, D., Rogosch, F. A., & Toth, S. L. (1998). Maternal depressive disorder and contextual risk: Contributions to the development of attachment insecurity and behavior problems in toddlerhood. *Development and Psychopathology, 10*(2), 283-300. doi: http://dx.doi.org/10.1017/S0954579498001618

Cicchetti, D., Rogosch, F. A., & Toth, S. L. (2006). Fostering secure attachment in infants in maltreating families through preventive interventions. *Development*

and Psychopathology, 18(3), 623-649. doi: http://dx.doi.org/10.1017/S0954579406060329

Cicchetti, D., Rogosch, F. A., & Toth, S. L. (2011). The effects of child maltreatment and polymorphisms of the serotonin transporter and dopamine D4 receptor genes on infant attachment and intervention efficacy. *Development and Psychopathology, 23*(2), 357-372. doi: http://dx.doi.org/10.1017/S0954579411000113

Coan, J. A. (2008). Toward a neuroscience of attachment *Handbook of attachment: Theory, research, and clinical applications* (2nd ed., pp. 241-265). New York, NY: Guilford Press; US.

Coates, B., Anderson, E. P., & Hartup, W. W. (1972). Interrelations in the attachment behavior of human infants. *Developmental Psychology, 6*(2), 218-230. doi: http://dx.doi.org/10.1037/h0032087

Colle, L., & Del Giudice, M. (2011). Patterns of attachment and emotional competence in middle childhood. *Social Development, 20*(1), 51-72. doi: http://dx.doi.org/10.1111/j.1467-9507.2010.00576.x

Collins, N. L., & Read, S. J. (1990). Adult attachment, working models, and relationship quality in dating couples. *Journal of Personality and Social Psychology, 58*(4), 644-663. doi: http://dx.doi.org/10.1037/0022-3514.58.4.644

Coppola, G., Vaughn, B. E., Cassibba, R., & Costantini, A. (2006). The attachment script representation procedure in an Italian sample: Associations with Adult Attachment Interview scales and with maternal sensitivity. *Attachment & Human Development, 8*(3), 209-219. doi: http://dx.doi.org/10.1080/14616730600856065

Crawford, T. N., Livesley, W., Jang, K. L., Shaver, P. R., Cohen, P., & Ganiban, J. (2007). Insecure attachment and personality disorder: A twin study of adults. *European Journal of Personality, 21*(2), 191-208. doi: http://dx.doi.org/10.1002/per.602

Crockenberg, S. B. (1981). Infant irritability, mother responsiveness, and social support influences on the security of infant-mother attachment. *Child Development, 52*(3), 857-865. doi: http://dx.doi.org/10.2307/1129087

Crowell, J. A., Treboux, D., & Brockmeyer, S. (2009). Parental divorce and adult children's attachment representations and marital status. *Attachment & Human Development, 11*(1), 87-101. doi: http://dx.doi.org/10.1080/14616730802500867

Crowell, J. A., Treboux, D., & Waters, E. (2002). Stability of attachment representations: The transition to marriage. *Developmental Psychology, 38*(4), 467-479. doi: http://dx.doi.org/10.1037/0012-1649.38.4.467

Cyr, C., Euser, E. M., Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2010). Attachment security and disorganization in maltreating and high-risk families: A series of meta-analyses. *Development and Psychopathology, 22*(1), 87-108. doi: http://dx.doi.org/10.1017/S0954579409990289

D'Onofrio, B. M., Turkheimer, E., Emery, R. E., Maes, H. H., Silberg, J., & Eaves, L. J. (2007). A Children of Twins study of parental divorce and offspring psychopathology. *Journal of Child Psychology and Psychiatry, 48*(7), 667-675. doi: http://dx.doi.org/10.1111/j.1469-7610.2007.01741.x

Dallaire, D. H., & Weinraub, M. (2005). The stability of parenting behaviors over the first 6 years of life. *Early Childhood Research Quarterly, 20*(2), 201-219. doi: http://dx.doi.org/10.1016/j.ecresq.2005.04.008

Dannlowski, U., Ohrmann, P., Konrad, C., Domschke, K., Bauer, J., Kugel, H., . . . Suslow, T. (2009). Reduced amygdala-prefrontal coupling in major depression: Association with MAOA genotype and illness severity. *International Journal of Neuropsychopharmacology, 12*(1), 11-22. doi: http://dx.doi.org/10.1017/S1461145708008973

Davis, M., & Whalen, P. (2001). The amygdala: Vigilance and emotion. *Molecular Psychiatry, 6*(1), 13-34. doi: http://dx.doi.org/10.1038/sj.mp.4000812

Dawson, G., Ashman, S. B., Hessl, D., Spieker, S., Frey, K., Panagiotides, H., & Embry, L. (2001). Autonomic and brain electrical activity in securely- and insecurely-attached infants of depressed mothers. *Infant Behavior & Development, 24*(2), 135-149. doi: Doi 10.1016/S0163-6383(01)00075-3

Dawson, G., Ashman, S. B., Panagiotides, H., Hessl, D., Self, J., Yamada, E., & Embry, L. (2003). Preschool Outcomes of Children of Depressed Mothers: Role of Maternal Behavior, Contextual Risk, and Children's Brain Activity. *Child Development, 74*(4), 1158-1175. doi: http://dx.doi.org/10.1111/1467-8624.00599

De Rosnay, M., & Harris, P. L. (2002). Individual differences in children's understanding of emotion: The roles of attachment and language. *Attachment & Human Development, 4*(1), 39-54. doi: http://dx.doi.org/10.1080/14616730210123139

De Wolff, M., & van IJzendoorn, M. H. (1997). Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development, 68*(4), 571-591. doi: http://dx.doi.org/10.2307/1132107

DeKlyen, M., & Greenberg, M. T. (2008). Attachment and psychopathology in childhood *Handbook of attachment: Theory, research, and clinical applications* (2nd ed., pp. 637-665). New York, NY: Guilford Press; US.

Dodge, K. A., & Coie, J. D. (1987). Social-information-processing factors in reactive and proactive aggression in children's peer groups. *Journal of Personality and Social Psychology, 53*(6), 1146-1158. doi: http://dx.doi.org/10.1037/0022-3514.53.6.1146

Donnellan, M., Burt, S., Levendosky, A. A., & Klump, K. L. (2008). Genes, personality, and attachment in adults: A multivariate behavioral genetic analysis. *Personality and Social Psychology Bulletin, 34*(1), 3-16. doi: http://dx.doi.org/10.1177/0146167207309199

Dozier, M. (1990). Attachment organization and treatment use for adults with serious psychopathological disorders. *Development and Psychopathology, 2*(1), 47-60. doi: http://dx.doi.org/10.1017/S0954579400000584

Dozier, M., Cue, K. L., & Barnett, L. (1994). Clinicians as caregivers: Role of attachment organization in treatment. *Journal of Consulting and Clinical Psychology, 62*(4), 793-800. doi: http://dx.doi.org/10.1037/0022-006X.62.4.793

Dozier, M., & Kobak, R. (1992). Psychophysiology in attachment interviews: Converging evidence for deactivating strategies. *Child Development, 63*(6), 1473-1480. doi: http://dx.doi.org/10.2307/1131569

Dozier, M., Peloso, E., Lewis, E., Laurenceau, J.-P., & Levine, S. (2008). Effects of an attachment-based intervention of the cortisol production of infants and toddlers in foster care. *Development and Psychopathology, 20*(3), 845-859. doi: http://dx.doi.org/10.1017/S0954579408000400

Dozier, M., Peloso, E., Lindhiem, O., Gordon, M., Manni, M., Sepulveda, S., . . . Levine, S. (2006). Developing Evidence-Based Interventions for Foster Children: An Example of a Randomized Clinical Trial with Infants and Toddlers. *Journal of Social Issues, 62*(4), 767-785. doi: http://dx.doi.org/10.1111/j.1540-4560.2006.00486.x

Dozier, M., Stovall, K., Albus, K. E., & Bates, B. (2001). Attachment for infants in foster care: The role of caregiver state of mind. *Child Development, 72*(5), 1467-1477. doi: http://dx.doi.org/10.1111/1467-8624.00360

Drake, K., Belsky, J., & Fearon, R. (2013). From Early Attachment to Engagement With Learning in School: The Role of Self-Regulation and Persistence. *Developmental Psychology May*(Pagination), No Pagination Specified. doi: http://dx.doi.org/10.1037/a0032779

Drury, S. S., Gleason, M. M., Theall, K. P., Smyke, A. T., Nelson, C. A., Fox, N. A., & Zeanah, C. H. (2012). Genetic sensitivity to the caregiving context: The influence of 5httlpr and BDNF val66met on indiscriminate social behavior. *Physiology & Behavior, 106*(5), 728-735. doi: http://dx.doi.org/10.1016/j.physbeh.2011.11.014

Dykas, M. J., & Cassidy, J. (2011). Attachment and the processing of social information across the life span: Theory and evidence. *Psychological Bulletin, 137*(1), 19-46. doi: http://dx.doi.org/10.1037/a0021367

Easterbrooks, M., Davidson, C. E., & Chazan, R. (1993). Psychosocial risk, attachment, and behavior problems among school-aged children. *Development and Psychopathology, 5*(3), 389-402. doi: http://dx.doi.org/10.1017/S095457940000448X

Ebstein, R. P., Israel, S., Chew, S. H., Zhong, S., & Knafo, A. (2010). Genetics of human social behavior. *Neuron, 65*(6), 831-844. doi: 10.1016/j.neuron.2010.02.020

Egeland, B., & Farber, E. A. (1984). Infant-mother attachment: Factors related to its development and changes over time. *Child Development, 55*(3), 753-771. doi: http://dx.doi.org/10.2307/1130127

Ellis, B. J., Boyce, W., Belsky, J., Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2011). Differential susceptibility to the environment: An evolutionary-neurodevelopmental theory. *Development and Psychopathology, 23*(1), 7-28. doi: http://dx.doi.org/10.1017/S0954579410000611

Erickson, M. F., Sroufe, L. A., & Egeland, B. (1985). The relationship between quality of attachment and behavior problems in preschool in a high-risk sample. *Monographs of the Society for Research in Child Development, 50*(1-2), 147-166. doi: http://dx.doi.org/10.2307/3333831

Fagot, B. I. (1995). Classification of problem behaviors in young children: A comparison of four systems. *Journal of Applied Developmental Psychology, 16*(1), 95-106. doi: http://dx.doi.org/10.1016/0193-3973%2895%2990018-7

Fagot, B. I., & Kavanagh, K. (1990). The prediction of antisocial behavior from avoidant attachment classification. *Child Development, 61*(3), 864-873. doi: http://dx.doi.org/10.2307/1130970

Fearon, P., Shmueli-Goetz, Y., Viding, E., Fonagy, P., & Plomin, R. (2013). Genetic and environmental influences on adolescent attachment. *Journal of Child Psychology and Psychiatry*. doi: 10.1111/jcpp.12171

Fearon, R., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Lapsley, A.-M., & Roisman, G. I. (2010). The significance of insecure attachment and

disorganization in the development of children s externalizing behavior: A meta-analytic study. *Child Development, 81*(2), 435-456. doi: http://dx.doi.org/10.1111/j.1467-8624.2009.01405.x

Fearon, R., & Belsky, J. (2004). Attachment and Attention: Protection in Relation to Gender and Cumulative Social-Contextual Adversity. *Child Development, 75*(6), 1677-1693. doi: http://dx.doi.org/10.1111/j.1467-8624.2004.00809.x

Fearon, R., & Mansell, W. (2001). Cognitive perspectives on unresolved loss: Insights from the study of PTSD. *Bulletin of the Menninger Clinic, 65*(3), 380-396. doi: http://dx.doi.org/10.1521/bumc.65.3.380.19845

Fearon, R., van IJzendoorn, M. H., Fonagy, P., Bakermans-Kranenburg, M. J., Schuengel, C., & Bokhorst, C. L. (2006). In search of shared and nonshared environmental factors in security of attachment: A behavior-genetic study of the association between sensitivity and attachment security. *Developmental Psychology, 42*(6), 1026-1040. doi: http://dx.doi.org/10.1037/0012-1649.42.6.1026

Fearon, R. M. P., & Belsky, J. (2011). Infant-mother attachment and the growth of externalizing problems across the primary-school years. *Journal of Child Psychology and Psychiatry, 52*(7), 782-791. doi: http://dx.doi.org/10.1111/j.1469-7610.2010.02350.x

Feeney, J. A., Noller, P., & Hanrahan, M. (1994). Assessing adult attachment *Attachment in adults: Clinical and developmental perspectives* (pp. 128-152). New York, NY: Guilford Press; US.

Fischer-Kern, M., Fonagy, P., Kapusta, N. D., Luyten, P., Boss, S., Naderer, A., . . . Leithner, K. (2013). Mentalizing in female inpatients with major depressive

disorder. *Journal of Nervous and Mental Disease, 201*(3), 201-207. doi: http://dx.doi.org/10.1097/NMD.0b013e3182845c0a

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

Fonagy, P., Leigh, T., Steele, M., Steele, H., Kennedy, R., Mattoon, G., . . . Gerber, A. (1996). The relation of attachment status, psychiatric classification, and response to psychotherapy. *Journal of Consulting and Clinical Psychology, 64*(1), 22-31. doi: http://dx.doi.org/10.1037/0022-006X.64.1.22

Fonagy, P., Redfern, S., & Charman, T. (1997). The relationship between belief-desire reasoning and a projective measure of attachment security (SAT). *British Journal of Developmental Psychology, 15*(Pt 1), 51-61. doi: http://dx.doi.org/10.1111/j.2044-835X.1997.tb00724.x

Fonagy, P., Steele, H., Steele, M., & Holder, J. (1997). Attachment and theory of mind: Overlapping constructs. *Association for Child Psychology and Psychiatry Occasional Papers, 14*, 31–40.

Fonagy, P., Steele, M., Steele, H., Moran, G. S., & Higgitt, A. C. (1991). The capacity for understanding mental states: The reflective self in parent and child and its significance for security of attachment. *Infant Mental Health Journal, 12*(3), 201-218. doi: http://dx.doi.org/10.1002/1097-0355%28199123%2912:3%3C201::AID-IMHJ2280120307%3E3.0.CO;2-7

Fonagy, P., & Target, M. (1996). Playing with reality: I. Theory of mind and the normal development of psychic reality. *The International Journal of Psychoanalysis, 77*(2), 217-233.

Fonagy, P., & Target, M. (2006). The Menatalization-Focused Approach to Self Pathology. *Journal of Personality Disorders, 20*(6), 544-576. doi: http://dx.doi.org/10.1521/pedi.2006.20.6.544

Fonagy, P., Target, M., Steele, H., & Steele, M. (1998). *Reflective-functioning manual, version 5.0, for application to adult attachment interviews*. London: University College London.

Forbes, L., Evans, E., Moran, G., & Pederson, D. (2007). Change in Atypical Maternal Behavior Predicts Change in Attachment Disorganization From 12 to 24 Months in a High-Risk Sample. *Child Development, 78*(3), 955-971. doi: http://dx.doi.org/10.1111/j.1467-8624.2007.01043.x

Fortuna, K., Roisman, G. I., Haydon, K. C., Groh, A. M., & Holland, A. S. (2011). Attachment states of mind and the quality of young adults' sibling relationships. *Developmental Psychology, 47*(5), 1366-1373. doi: http://dx.doi.org/10.1037/a0024393

Fox, N. A., & Hane, A. A. (2008). Studying the biology of human attachment *Handbook of attachment: Theory, research, and clinical applications* (2nd ed., pp. 217-240). New York, NY: Guilford Press; US.

Fraley, R. C. (2002). Attachment stability from infancy to adulthood: Meta-analysis and dynamic modeling of developmental mechanisms. *Personality and Social Psychology Review, 6*(2), 123-151. doi: http://dx.doi.org/10.1207/S15327957PSPR0602_03

Fraley, R. C., Brumbaugh, C. C., & Marks, M. J. (2005). The Evolution and Function of Adult Attachment: A Comparative and Phylogenetic Analysis. *Journal of Personality and Social Psychology, 89*(5), 731-746. doi: http://dx.doi.org/10.1037/0022-3514.89.5.751

Fraley, R. C., & Roisman, G. I. (in press). Categories or dimensions? A taxometric analysis of the Adult Attachment Interview. In C. Booth-LaForce & G. I. Roisman (Eds.), *The Adult Attachment Interview: Psychometrics, stability and change from infancy, and developmental origins. Monographs of the Society for Research in Child Development*.

Fraley, R. C., & Spieker, S. J. (2003). Are infant attachment patterns continuously or categorically distributed? A taxometric analysis of strange situation behavior. *Developmental Psychology*, *39*(3), 387-404. doi: http://dx.doi.org/10.1037/0012-1649.39.3.387

Fraley, R. C., Waller, N. G., & Brennan, K. A. (2000). An item response theory analysis of self-report measures of adult attachment. *Journal of Personality and Social Psychology*, *78*(2), 350-365. doi: http://dx.doi.org/10.1037/0022-3514.78.2.350

Franz, C. E., York, T. P., Eaves, L. J., Prom-Wormley, E., Jacobson, K. C., Lyons, M. J., . . . Kremen, W. S. (2011). Adult romantic attachment, negative emotionality, and depressive symptoms in middle aged men: A multivariate genetic analysis. *Behavior Genetics*, *41*(4), 488-498. doi: http://dx.doi.org/10.1007/s10519-010-9428-z

Freud, S. (1938). An outline of psychoanalysis. In J.Strachey (Ed.), *The standard edition of the complete psychological works of Sigmund Freud* (Vol. 23, pp. 139-208). London: Hogarth.

Frigerio, A., Ceppi, E., Rusconi, M., Giorda, R., Raggi, M. E., & Fearon, P. (2009). The role played by the interaction between genetic factors and attachment in the stress response in infancy. *Journal of Child Psychology and Psychiatry*, *50*(12), 1513-1522. doi: http://dx.doi.org/10.1111/j.1469-7610.2009.02126.x

Frodi, A., Grolnick, W., & Bridges, L. (1985). Maternal correlates of stability and change in infant-mother attachment. *Infant Mental Health Journal, 6*(2), 60-67. doi: http://dx.doi.org/10.1002/1097-0355%28198522%296:2%3C60::AID-IMHJ2280060203%3E3.0.CO;2-Q

Fusar-Poli, P., Placentino, A., Carletti, F., Landi, P., Allen, P., Surguladze, S., . . . Politi, P. (2009). Functional atlas of emotional faces processing: A voxel-based meta-analysis of 105 functional magnetic resonance imaging studies. *Journal of Psychiatry & Neuroscience, 34*(6), 418-432.

Gaensbauer, T. J., Connell, J. P., & Schulz, L. A. (1983). Emotion and attachment: Interrelationships in a structured laboratory paradigm. *Developmental Psychology, 19*(6), 815-831. doi: http://dx.doi.org/10.1037/0012-1649.19.6.815

Galynker, I. I., Yaseen, Z. S., Katz, C., Zhang, X., Jennings-Donovan, G., Dashnaw, S., . . . Winston, A. (2012). Distinct but overlapping neural networks subserve depression and insecure attachment. *Social Cognitive and Affective Neuroscience, 7*(8), 896-908. doi: http://dx.doi.org/10.1093/scan/nsr074

Gamer, M., Zurowski, B., & Buchel, C. (2010). Different amygdala subregions mediate valence related and attentional effects of oxytocin in humans. *PNAS Proceedings of the National Academy of Sciences of the United States of America, 107*(20), 9400-9405. doi: http://dx.doi.org/10.1073/pnas.1000985107

George, C., Kaplan, N., & Main, M. (1985). *Adult Attachment Interview protocol*: Unpublished manuscript, University of California, Berkeley.

George, C., & Solomon, J. (1999). The development of caregiving: A comparison of attachment theory and psychoanalytic approaches to mothering.

Psychoanalytic Inquiry, 19(4), 618-646. doi: http://dx.doi.org/10.1080/07351699909534268

Gerber, A., J, Fonagy, P., Bateman, A., & Higgitt, A. (2004). Structural and symptomatic change in psychoanalysis and psychodynamic psychotherapy of young adults: a quantitative study of process and outcome. *Journal of the American Psychoanalytic Association, 52*(4), 1235-1236.

Gewirtz, J. L. (1972a). Attachment, dependence, and a distinction in terms of stimulus control *Gewirtz, Jacob L (1972) Attachment and dependency x, 251 pp Oxford, England: V H Winston & Sons; England*.

Gewirtz, J. L. (1972b). On the selection and use of attachment and dependence indices *Gewirtz, Jacob L (1972) Attachment and dependency x, 251 pp Oxford, England: V H Winston & Sons; England*.

Gilissen, R., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., & van der Veer, R. (2008). Parent-child relationship, temperament, and physiological reactions to fear-inducing film clips: Further evidence for differential susceptibility. *Journal of Experimental Child Psychology, 99*(3), 182-195. doi: http://dx.doi.org/10.1016/j.jecp.2007.06.004

Gilliom, M., Shaw, D. S., Beck, J. E., Schonberg, M. A., & Lukon, J. L. (2002). Anger regulation in disadvantaged preschool boys: Strategies, antecedents, and the development of self-control. *Developmental Psychology, 38*(2), 222-235. doi: http://dx.doi.org/10.1037/0012-1649.38.2.222

Goldberg, S. (1997). Attachment and childhood behavior problems in normal, at-risk and clinical samples *Attachment and psychopathology* (pp. 171-195). New York, NY: Guilford Press; US.

Goldberg, S., Benoit, D., Blokland, K., & Madigan, S. (2003). Atypical maternal behavior, maternal representations, and infant disorganized attachment. *Development and Psychopathology, 15*(2), 239-257. doi: http://dx.doi.org/10.1017/S0954579403000130

Goldberg, S., Gotowiec, A., & Simmons, R. J. (1995). Infant-mother attachment and behavior problems in healthy and chronically ill preschoolers. *Development and Psychopathology, 7*(2), 267-282. doi: http://dx.doi.org/10.1017/S0954579400006490

Goldsmith, H., & Alansky, J. A. (1987). Maternal and infant temperamental predictors of attachment: A meta-analytic review. *Journal of Consulting and Clinical Psychology, 55*(6), 805-816. doi: http://dx.doi.org/10.1037/0022-006X.55.6.805

Goldwyn, R., Stanley, C., Smith, V., & Green, J. (2000). The Manchester Child Attachment Story Task: Relationship with parental AAI, SAT and child behaviour. *Attachment & Human Development, 2*(1), 71-84. doi: http://dx.doi.org/10.1080/146167300361327

Goossens, F. A., van IJzendoorn, M. H., Tavecchio, L., & Kroonenberg, P. M. (1986). Stability of attachment across time and context in a Dutch sample. *Psychological Reports, 58*(1), 23-32. doi: http://dx.doi.org/10.2466/pr0.1986.58.1.23

Greenberg, M. T., Cicchetti, D., & Cummings, E. M. (1990). Attachment in the preschool years: Theory, research, and intervention *Attachment in the preschool years: Theory, research, and intervention* (pp. xix, 507). Chicago, IL: University of Chicago Press; US.

Greenberg, M. T., Speltz, M. L., & DeKlyen, M. (1993). The role of attachment in the early development of disruptive behavior problems. *Development and Psychopathology, 5*(1-2), 191-213. doi: http://dx.doi.org/10.1017/S095457940000434X

Greig, A., & Howe, D. (2001). Social understanding, attachment security of preschool children and maternal mental health. *British Journal of Developmental Psychology, 19*(3), 381-393. doi: http://dx.doi.org/10.1348/026151001166164

Griffin, D. W., & Bartholomew, K. (1994). Models of the self and other: Fundamental dimensions underlying measures of adult attachment. *Journal of Personality and Social Psychology, 67*(3), 430-445. doi: http://dx.doi.org/10.1037/0022-3514.67.3.430

Groh, A. M., Fearon, R. M. P., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Steele, R. D., & Roisman, G. I. (under review). *The Significance of Attachment Security for Children's Social Competence with Peers: A Meta-Analytic Study*: Manuscript submitted for publication.

Groh, A. M., & Roisman, G. I. (2009). Adults' autonomic and subjective emotional responses to infant vocalizations: The role of secure base script knowledge. *Developmental Psychology, 45*(3), 889-893. doi: http://dx.doi.org/10.1037/a0014943

Groh, A. M., Roisman, G. I., Booth-LaForce, C., Fraley, R. C., Owen, M., Cox, M., & Burchinal, M. (in press). Stability of Attachment Security from Infancy to Late Adolescence. In C. Booth-LaForce & G. I. Roisman (Eds.), *The Adult Attachment Interview: Psychometrics, stability and change from infancy, and developmental origins. Monographs of the Society for Research in Child Development.*

Groh, A. M., Roisman, G. I., van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., & Fearon, R. (2012). The significance of insecure and disorganized attachment for children's internalizing symptoms: A meta-analytic study. *Child Development, 83*(2), 591-610.

Grossmann, K. E., Grossmann, K., & Waters, E. (2005). Attachment from infancy to adulthood: The major longitudinal studies *Attachment from infancy to adulthood: The major longitudinal studies* (pp. xiv, 332). New York, NY: Guilford Publications; US.

Gunnar, M., & Quevedo, K. (2007). The Neurobiology of Stress and Development. *Annual Review of Psychology, 58*, 145-173. doi: http://dx.doi.org/10.1146/annurev.psych.58.110405.085605

Gunnar, M. R. (2005). Attachment and Stress in Early Development: Does Attachment Add to the Potency of Social Regulators of Infant Stress? [References] *Attachment and bonding: A new synthesis* (pp. 245-255). Cambridge, MA: MIT Press; US.

Gunnar, M. R., Brodersen, L., Nachmias, M., Buss, K., & Rigatuso, J. (1996). Stress reactivity and attachment security. *Developmental Psychobiology, 29*(3), 191-204. doi: http://dx.doi.org/10.1002/%28SICI%291098-2302%28199604%2929:3%3C191::AID-DEV1%3E3.0.CO;2-M

Guttmann-Steinmetz, S., & Crowell, J. A. (2006). Attachment and externalizing disorders: A developmental psychopathology perspective. *Journal of the American Academy of Child & Adolescent Psychiatry, 45*(4), 440-451. doi: http://dx.doi.org/10.1097/01.chi.0000196422.42599.63

Haltigan, J. D., Roisman, G. I., & Fraley, R. C. (2013). The predictive significance of early caregiving experiences for symptoms of psychopathology through

midadolescence: Enduring or transient effects? *Development and Psychopathology, 25*(01), 209-221. doi: http://dx.doi.org/10.1017/S0954579412000260

Haltigan, J. D., Roisman, G. I., & Haydon, K. C. (in press). The latent structure of the Adult Attachment Interview: Exploratory and confirmatory evidence. In C. Booth-LaForce & G. I. Roisman (Eds.), *The Adult Attachment Interview: Psychometrics, stability and change from infancy, and developmental origins. Monographs of the Society for Research in Child Development*.

Hamilton, C. E. (2000). Continuity and discontinuity of attachment from infancy through adolescence. *Child Development, 71*(3), 690-694. doi: http://dx.doi.org/10.1111/1467-8624.00177

Harari, D., Bakermans-Kranenburg, M. J., de Kloet, C., Geuze, E., Vermetten, E., Westenberg, H., & van IJzendoorn, M. H. (2009). Attachment representations in Dutch veterans with and without deployment-related PTSD. *Attachment & Human Development, 11*(6), 515-536. doi: http://dx.doi.org/10.1080/14616730903282480

Harlow, H. F., & Zimmermann, R. R. (1959). Affectional responses in the infant monkey. *Science, 130*, 421-432. doi: http://dx.doi.org/10.1126/science.130.3373.421

Haydon, K., Roisman, G., Marks, M. J., & Fraley, R. C. (2011). An empirically derived approach to the latent structure of the Adult Attachment Interview: Additional convergent and discriminant validity evidence. *Attachment & Human Development, 13*(5), 503-524. doi: http://dx.doi.org/10.1080/14616734.2011.602253

Haydon, K. C., Roisman, G. I., Owen, M. T., Booth-LaForce, C., & Cox, M. (in press). Shared and distinctive antecedents of Adult Attachment Interview state-of-mind and inferred experience dimensions. In C. Booth-LaForce & G. I. Roisman (Eds.), *The Adult Attachment Interview: Psychometrics, stability and change from infancy, and developmental origins. Monographs of the Society for Research in Child Development*.

Hesse, E. (1999). The adult attachment interview: Historical and current perspectives *Handbook of attachment: Theory, research, and clinical applications* (pp. 395-433). New York, NY: Guilford Press; US.

Hesse, E. (2008). The Adult Attachment Interview: Protocol, method of analysis, and empirical studies *Handbook of attachment: Theory, research, and clinical applications* (2nd ed., pp. 552-598). New York, NY: Guilford Press; US.

Hill-Soderlund, A. L., Mills-Koonce, W., Propper, C., Calkins, S. D., Granger, D. A., Moore, G. A., . . . Cox, M. J. (2008). Parasympathetic and sympathetic responses to the strange situation in infants and mothers from avoidant and securely attached dyads. *Developmental Psychobiology, 50*(4), 361-376. doi: http://dx.doi.org/10.1002/dev.20302

Hofer, M. A. (1994). Hidden regulators in attachment, separation, and loss. *Monographs of the Society for Research in Child Development, 59*(2-3), 192-207, 250-283. doi: http://dx.doi.org/10.2307/1166146

Holland, A. S., & Roisman, G. I. (2010). Adult attachment security and young adults' dating relationships over time: self-reported, observational, and physiological evidence. *Developmental psychology, 46*(2), 552-577. doi: 10.1037/a0018542

Howes, C., & Hamilton, C. E. (1992). Children's relationships with child care teachers: Stability and concordance with parental attachments. *Child Development, 63*(4), 867-878. doi: http://dx.doi.org/10.2307/1131239

Isabella, R. A. (1993). Origins of attachment: Maternal interactive behavior across the first year. *Child Development, 64*(2), 605-621. doi: http://dx.doi.org/10.2307/1131272

Izard, C. E., Youngstrom, E. A., Fine, S. E., Mostow, A. J., & Trentacosta, C. J. (2006). Emotions and developmental psychopathology *Developmental psychopathology, Vol 1: Theory and method* (2nd ed., pp. 244-292). Hoboken, NJ: John Wiley & Sons Inc; US.

Jacobsen, T., Huss, M., Fendrich, M., Kruesi, M. J., & Ziegenhain, U. (1997). Children's ability to delay gratification: Longitudinal relations to mother-child attachment. *The Journal of Genetic Psychology: Research and Theory on Human Development, 158*(4), 411-426. doi: http://dx.doi.org/10.1080/00221329709596679

Jacobvitz, D., Leon, K., & Hazen, N. (2006). Does expectant mothers' unresolved trauma predict frightened/frightening maternal behavior? Risk and protective factors. *Development and Psychopathology, 18*(2), 363-379. doi: http://dx.doi.org/10.1017/S0954579406060196

Johnson, W. (2010). Understanding the genetics of intelligence: Can height help? Can corn oil? *Current Directions in Psychological Science, 19*(3), 177-182. doi: http://dx.doi.org/10.1177/0963721410370136

Juffer, F., Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2008). Promoting positive parenting: An attachment-based intervention *(2008) Promoting*

positive parenting: An attachment-based intervention xix, 238 pp New York, NY: Taylor & Francis Group/Lawrence Erlbaum Associates.

Juster, R.-P., McEwen, B. S., & Lupien, S. J. (2010). Allostatic load biomarkers of chronic stress and impact on health and cognition. *Neuroscience and Biobehavioral Reviews, 35*(1), 2-16. doi: http://dx.doi.org/10.1016/j.neubiorev.2009.10.002

Kagan, J., Snidman, N., Arcus, D., & Reznick, J. S. (1994). *Galen's prophecy: Temperament in human nature*. New York, NY: Basic Books; US.

Kantrowitz, J., L. (1993). Outcome research in psychoanalysis: Review and reconsiderations. *Journal of the American Psychoanalytic Association, 41*, 313-329.

Kaplan, N. (1987). *Individual differences in six-year-olds' thoughts about separation: Predicted from attachment to mother at one year of age*: Unpublished doctoral dissertation, University of California at Berkeley.

Kaplan, N., & Main, M. (1986). *A system for the analysis of children's family drawings in terms of attachment*: Unpublished manuscript, University of California at Berkeley.

Karg, K., Burmeister, M., Shedden, K., & Sen, S. (2011). The serotonin transporter promoter variant (5-HTTLPR), stress, and depression meta-analysis revisited: Evidence of genetic moderation. *Archives of General Psychiatry, 68*(5), 444-454. doi: http://dx.doi.org/10.1001/archgenpsychiatry.2010.189

Kelly, K., Grienenberger, J., & Slade, A. (2005). Maternal reflective functioning, mother-infant affective communication, and infant attachment: Exploring the link between mental states and observed caregiving behavior in the intergenerational transmission of attachment. *Attachment & Human*

Development, 7(3), 299-311. doi: http://dx.doi.org/10.1080/14616730500245963

Kendler, K. S. (2013). What psychiatric genetics has taught us about the nature of psychiatric illness and what is left to learn. *Mol Psychiatry, 18*(10), 1058-1066. doi: 10.1038/mp.2013.50

Kerns, K. A. (2008). Attachment in middle childhood *Handbook of attachment: Theory, research, and clinical applications* (2nd ed., pp. 366-382). New York, NY: Guilford Press; US.

Kiang, L., & Furman, W. (2007). Representations of attachment to parents in adolescent sibling pairs: Concordant or discordant? *New directions for child and adolescent development, 2007*(117), 73-89. doi: http://dx.doi.org/.10.1002/cd.195

Kidwell, S. L., Young, M. E., Hinkle, L. D., Ratliff, A. D., Marcum, M. E., & Martin, C. N. (2010). Emotional competence and behavior problems: Differences across preschool assessment of attachment classifications. *Clinical Child Psychology and Psychiatry*, *15*(3), 391-406. doi: http://dx.doi.org/10.1177/1359104510367589

Kirsh, S. J., & Cassidy, J. (1997). Preschoolers' attention to and memory for attachment-relevant information. *Child Development, 68*(6), 1143-1153. doi: http://dx.doi.org/10.2307/1132297

Klagsbrun, M., & Bowlby, J. (1976). Responses to separation from parents: A clinical test for young children. *British Journal of Projective Psychology and Personality Study, 21*, 7-26.

Kobak, R. (1989). *The Attachment Interview Q-Set*: Unpublished manuscript.

Kobak, R., Cassidy, J., Lyons-Ruth, K., & Zir, Y. (2005). Attachment, stress and psychopathology: A developmental pathways model. In D. Cicchetti & D. J. Cohen (Eds.), *Handbook of Developmental Psychopathology* (pp. 333-369). Cambridge: Cambridge University Press.

Kochanska, G. (1997). Mutually responsive orientation between mothers and their young children: Implications for early socialization. *Child Development, 68*(1), 94-112. doi: http://dx.doi.org/10.2307/1131928

Kochanska, G., & Kim, S. (2013). Early attachment organization with both parents and future behavior problems: From infancy to middle childhood. *Child Development, 84*(1), 283-296. doi: http://dx.doi.org/10.1111/j.1467-8624.2012.01852.x

Koren-Karie, N., Oppenheim, D., Dolev, S., Sher, E., & Etzion-Carasso, A. (2002). Mothers' insightfulness regarding their infants' internal experience: Relations with maternal sensitivity and infant attachment. *Developmental Psychology, 38*(4), 534-542. doi: http://dx.doi.org/10.1037/0012-1649.38.4.534

Korfmacher, J., Adam, E., Ogawa, J., & Egeland, B. (1997). Adult attachment: Implications for the therapeutic process in a home visitation intervention. *Applied Developmental Science, 1*(1), 43-52. doi: http://dx.doi.org/10.1207/s1532480xads0101_5

Kringelbach, M. L. (2005). The human orbitofrontal cortex: Linking reward to hedonic experience. *Nature Reviews Neuroscience, 6*(9), 691-702. doi: http://dx.doi.org/10.1038/nrn1747

Kringelbach, M. L., Lehtonen, A., Squire, S., Harvey, A. G., Craske, M. G., Holliday, I. E., . . . Stein, A. (2008). A specific and rapid neural signature for parental instinct. *PLoS One, 3*(2), e1664. doi: 10.1371/journal.pone.0001664

Kroonenberg, P. M., & van IJzendoorn, M. H. (1987). Exploring children's behavior in the Strange Situation. In L. W. C. Tavecchio & M. H. Van Ijzendoorn (Eds.), *Attachment in Social Networks* (Vol. 44, pp. 379-425).

Kumsta, R., Kreppner, J., Rutter, M., Beckett, C., Castle, J., Stevens, S., & Sonuga-Barke, E. J. (2010). Deprivation-specific psychological patterns. *Monographs of the Society for Research in Child Development, 75*(1), 48-78. doi: http://dx.doi.org/10.1111/j.1540-5834.2010.00550.x

Laible, D. J., & Thompson, R. A. (1998). Attachment and emotional understanding in preschool children. *Developmental Psychology, 34*(5), 1038-1045. doi: http://dx.doi.org/10.1037/0012-1649.34.5.1038

Lakatos, K., Nemoda, Z., Toth, I., Ronai, Z., Ney, K., Sasvari- Szekely, M., & Gervai, J. (2002). Further evidence for the role of the dopamine D4 receptor (DRD4) gene in attachment disorganization: Interaction of the exon III 48-bp repeat and the -521 C/T promoter polymorphisms. *Molecular Psychiatry, 7*(1), 27-31. doi: http://dx.doi.org/10.1038/sj/mp/4000986

Lakatos, K., Toth, I., Nemoda, Z., Ney, K., Sasvari-Szekely, M., & Gervai, J. (2000). Dopamine D4 receptor (DRD4) gene polymorphism is associated with attachment disorganization in infants. *Molecular Psychiatry, 5*(633-637).

Lamb, M. E., Thompson, R. A., Gardner, W. P., Charnov, E. L., & Estes, D. (1984). Security of infantile attachment as assessed in the "strange situation": Its study and biological interpretation. *Behavioral and Brain Sciences, 7*(1), 127-171. doi: http://dx.doi.org/10.1017/S0140525X00026522

Laranjo, J., Bernier, A., & Meins, E. (2008). Associations between maternal mind-mindedness and infant attachment security: Investigating the mediating role of

maternal sensitivity. *Infant Behavior & Development, 31*(4), 688-695. doi: http://dx.doi.org/10.1016/j.infbeh.2008.04.008

Larose, S., & Bernier, A. (2001). Social support processes: Mediators of attachment state of mind and adjustment in late adolescence. *Attachment & Human Development, 3*(1), 96-120. doi: http://dx.doi.org/10.1080/14616730010024762

Leerkes, E. M. (2011). Maternal sensitivity during distressing tasks: A unique predictor of attachment security. *Infant Behavior & Development, 34*(3), 443-446. doi: http://dx.doi.org/10.1016/j.infbeh.2011.04.006

Leerkes, E. M., & Wong, M. S. (2012). Infant distress and regulatory behaviors vary as a function of attachment security regardless of emotion context and maternal involvement. *Infancy, 17*(5), 455-478. doi: http://dx.doi.org/10.1111/j.1532-7078.2011.00099.x

Lenzi, D., Trentini, C., Pantano, P., Macaluso, E., Lenzi, G. L., & Ammaniti, M. (2012). Attachment models affect brain responses in areas related to emotions and empathy in nulliparous women. *Human Brain Mapping, 34*(6), 1399-1414. doi: http://dx.doi.org/10.1002/hbm.21520.

Levy, K. N., Beeney, J. E., & Temes, C. M. (2011). Attachment and its vicissitudes in borderline personality disorder. *Current Psychiatry Reports, 13*(1), 50-59. doi: http://dx.doi.org/10.1007/s11920-010-0169-8

Lewis, M., Feiring, C., McGuffog, C., & Jaskir, J. (1984). Predicting psychopathology in six-year-olds from early social relations. *Child Development, 55*(1), 123-136. doi: http://dx.doi.org/10.2307/1129839

Lewis, M., Feiring, C., & Rosenthal, S. (2000). Attachment over time. *Child Development, 71*(3), 707-720. doi: http://dx.doi.org/10.1111/1467-8624.00180

Lewis-Morrarty, E., Dozier, M., Bernard, K., Terracciano, S. M., & Moore, S. V. (2012). Cognitive flexibility and theory of mind outcomes among foster children: Preschool follow-up results of a randomized clinical trial. *Journal of Adolescent Health, 51*(2, Suppl), S17-S22. doi: http://dx.doi.org/10.1016/j.jadohealth.2012.05.005

Lindhiem, O., Bernard, K., & Dozier, M. (2011). Maternal sensitivity: Within-person variability and the utility of multiple assessments. *Child Maltreatment, 16*(1), 41-50. doi: http://dx.doi.org/10.1177/1077559510387662

Liotti, G. (2004). Trauma, dissociation, and disorganized attachment: Three strands of a single braid. *Psychotherapy: Theory, Research, Practice, Training, 41*(4), 472-486. doi: http://dx.doi.org/10.1037/0033-3204.41.4.472

Lorberbaum, J. P., Newman, J. D., Horwitz, A. R., Dubno, J. R., Lydiard, R., Hamner, M. B., . . . George, M. S. (2002). A potential role for thalamocingulate circuitry in human maternal behavior. *Biological Psychiatry, 51*(6), 431-445. doi: http://dx.doi.org/10.1016/S0006-3223%2801%2901284-7

Lucassen, N., Tharner, A., van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., Volling, B. L., Verhulst, F. C., . . . Tiemeier, H. (2011). The association between paternal sensitivity and infant-father attachment security: A meta-analysis of three decades of research. *Journal of Family Psychology, 25*(6), 986-992. doi: http://dx.doi.org/10.1037/a0025855

Luijk, M. P., Roisman, G. I., Haltigan, J. D., Tiemeier, H., Booth-LaForce, C., van IJzendoorn, M. H., . . . Hofman, A. (2011). Dopaminergic, serotonergic, and oxytonergic candidate genes associated with infant attachment security and disorganization? In search of main and interaction effects. *Journal of Child Psychology and Psychiatry, 52*(12), 1295-1307.

Luijk, M. P., Saridjan, N., Tharner, A., van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., Jaddoe, V. W., . . . Tiemeier, H. (2010). Attachment, depression, and cortisol: Deviant patterns in insecure-resistant and disorganized infants. *Developmental Psychobiology, 52*(5), 441-452.

Luijk, M. P., Tharner, A., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Jaddoe, V. W., Hofman, A., . . . Tiemeier, H. (2011). The association between parenting and attachment security is moderated by a polymorphism in the mineralocorticoid receptor gene: evidence for differential susceptibility. *Biological psychology, 88*(1), 37-40. doi: 10.1016/j.biopsycho.2011.06.005

Luijk, M. P., Velders, F. P., Tharner, A., van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., Jaddoe, V. W., . . . Tiemeier, H. (2010). FKBP5 and resistant attachment predict cortisol reactivity in infants: Gene-environment interaction. *Psychoneuroendocrinology, 35*(10), 1454-1461.

Lundy, B. L. (2003). Father- and mother-infant face-to-face interactions: Differences in mind-related comments and infant attachment? *Infant Behavior & Development, 26*(2), 200-212. doi: http://dx.doi.org/10.1016/S0163-6383%2803%2900017-1

Lupien, S. J., McEwen, B. S., Gunnar, M. R., & Heim, C. (2009). Effects of stress throughout the lifespan on the brain, behaviour and cognition. *Nature Reviews Neuroscience, 10*(6), 434-445. doi: http://dx.doi.org/10.1038/nrn2639

Lyons-Ruth, K., Bronfman, E., & Parsons, E. (1999). Maternal frightened, frightening, or atypical behavior and disorganized infant attachment patterns. *Monographs of the Society for Research in Child Development, 64*(3), 67-96. doi: http://dx.doi.org/10.1111/1540-5834.00034

Lyons-Ruth, K., Easterbrooks, M., & Cibelli, C. D. (1997). Infant attachment strategies, infant mental lag, and maternal depressive symptoms: Predictors of internalizing and externalizing problems at age 7. *Developmental Psychology, 33*(4), 681-692. doi: http://dx.doi.org/10.1037/0012-1649.33.4.681

MacBeth, A., Gumley, A., Schwannauer, M., & Fisher, R. (2011). Attachment states of mind, mentalization, and their correlates in a first-episode psychosis sample. *Psychology and Psychotherapy: Theory, Research and Practice, 84*(1), 42-57.

Maccoby, E. E., & Feldman, S. (1972). Mother-attachment and stranger-reactions in the third year of life. *Monographs of the Society for Research in Child Development, 37*(1), 86. doi: http://dx.doi.org/10.2307/1165693

Madigan, S., Atkinson, L., Laurin, K., & Benoit, D. (2013). Attachment and internalizing behavior in early childhood: A meta-analysis. *Developmental Psychology, 49*(4), 672-689. doi: http://dx.doi.org/10.1037/a0028793

Madigan, S., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Moran, G., Pederson, D. R., & Benoit, D. (2006). Unresolved states of mind, anomalous parental behavior, and disorganized attachment: A review and meta-analysis of a transmission gap. *Attachment & Human Development, 8*(2), 89-111. doi: http://dx.doi.org/10.1080/14616730600774458

Madigan, S., Benoit, D., & Boucher, C. (2011). Exploration of the links among fathers' unresolved states of mind with respect to attachment, atypical paternal behavior, and disorganized infant-father attachment. *Infant Mental Health Journal, 32*(3), 286-304. doi: http://dx.doi.org/10.1002/imhj.20297

Madigan, S., Moran, G., & Pederson, D. R. (2006). Unresolved states of mind, disorganized attachment relationships, and disrupted interactions of adolescent

mothers and their infants. *Developmental Psychology, 42*(2), 293-304. doi: http://dx.doi.org/10.1037/0012-1649.42.2.293

Main, M. (1991). Metacognitive knowledge, metacognitive monitoring, and singular (coherent) vs. multiple (incoherent) model of attachment: Findings and directions for future research *Attachment across the life cycle* (pp. 127-159). New York, NY: Tavistock/Routledge; US.

Main, M. (1996). Introduction to the special section on attachment and psychopathology: 2. Overview of the field of attachment. *Journal of Consulting and Clinical Psychology, 64*(2), 237-243. doi: http://dx.doi.org/10.1037/0022-006X.64.2.237

Main, M. (2000). The Adult Attachment Interview as related to the Ainsworth Strange Situation. *Journal of the American Psychoanalytic Association, 48*, 1055-1096.

Main, M. (2001). *Attachment to mother and father in infancy as related to the Adult Attachment Interview and to a self-visualization task at age 19*: Poster session presented at the biennial meeting of the Society for Research in Child Development, Minneapolis, MN.

Main, M., & Cassidy, J. (1988). Categories of response to reunion with the parent at age 6: Predictable from infant attachment classifications and stable over a 1-month period. *Developmental Psychology, 24*(3), 415-426. doi: http://dx.doi.org/10.1037/0012-1649.24.3.415

Main, M., Goldwyn, R., & Hesse, E. (2003). *The Adult Attachment Interview: Scoring and Classification System, Version 7.2*: Unpublished manuscript, University of California at Berkeley.

Main, M., & Hesse, E. (1990). Parents' unresolved traumatic experiences are related to infant disorganized attachment status: Is frightened and/or frightening parental behavior the linking mechanism? *Attachment in the preschool years: Theory, research, and intervention* (pp. 161-182). Chicago, IL: University of Chicago Press; US.

Main, M., Hesse, E., & Kaplan, N. (2005). Predictability of Attachment Behavior and Representational Processes at 1, 6, and 19 Years of Age: The Berkeley Longitudinal Study *Attachment from infancy to adulthood: The major longitudinal studies* (pp. 245-304). New York, NY: Guilford Publications; US.

Main, M., Kaplan, N., & Cassidy, J. (1985). Security in infancy, childhood, and adulthood: A move to the level of representation. *Monographs of the Society for Research in Child Development, 50*(1-2), 66-104. doi: http://dx.doi.org/10.2307/3333827

Main, M., & Solomon, J. (1986). Discovery of an insecure-disorganized/disoriented attachment pattern *Affective development in infancy* (pp. 95-124). Westport, CT: Ablex Publishing; US.

Main, M., & Solomon, J. (1990). Procedures for identifying infants as disorganized/disoriented during the Ainsworth Strange Situation *Attachment in the preschool years: Theory, research, and intervention* (pp. 121-160). Chicago, IL: University of Chicago Press; US.

Main, M., & Weston, D. R. (1981). The quality of the toddler's relationship to mother and to father: Related to conflict behavior and the readiness to establish new relationships. *Child Development, 52*(3), 932-940. doi: http://dx.doi.org/10.2307/1129097

Mangelsdorf, S., Gunnar, M., Kestenbaum, R., Lang, S., & Andreas, D. (1990). Infant proneness-to-distress temperament, maternal personality, and mother-infant attachment: Associations and goodness of fit. *Child Development, 61*(3), 820-831. doi: http://dx.doi.org/10.2307/1130966

Martins, E. C., Soares, I., Martins, C., Tereno, S., & Osorio, A. (2012). Can we identify emotion over-regulation in infancy? Associations with avoidant attachment, dyadic emotional interaction and temperament. *Infant and Child Development, 21*(6), 579-595. doi: http://dx.doi.org/10.1002/icd.1760

Marvin, R. S., & Britner, P. A. (2008). Normative development: The ontogeny of attachment *Handbook of attachment: Theory, research, and clinical applications* (2nd ed., pp. 269-294). New York, NY: Guilford Press; US.

Masters, J. C., & Wellman, H. M. (1974). The study of human infant attachment: A procedural critique. *Psychological Bulletin, 81*(4), 218-237. doi: http://dx.doi.org/10.1037/h0036184

McCall, R., van IJzendoorn, M. H., Juffer, F., Groark, C., & Groza, V. (2012). Children without permanent parents: Research, practice, and policy. *Monographs of the Society for Research in Child Development*.

McElwain, N. L., & Booth-LaForce, C. (2006). Maternal sensitivity to infant distress and nondistress as predictors of infant-mother attachment security. *Journal of Family Psychology, 20*(2), 247-255. doi: http://dx.doi.org/10.1037/0893-3200.20.2.247

McElwain, N. L., & Volling, B. L. (2004). Attachment security and parental sensitivity during infancy: Associations with friendship quality and false-belief understanding at age 4. *Journal of Social and Personal Relationships, 21*(5), 639-667. doi: http://dx.doi.org/10.1177/0265407504045892

Meins, E., Fernyhough, C., de Rosnay, M., Arnott, B., Leekam, S. R., & Turner, M. (2012). Mind-mindedness as a multidimensional construct: Appropriate and nonattuned mind-related comments independently predict infant-mother attachment in a socially diverse sample. *Infancy, 17*(4), 393-415. doi: http://dx.doi.org/10.1111/j.1532-7078.2011.00087.x

Meins, E., Fernyhough, C., Fradley, E., & Tuckey, M. (2001). Rethinking maternal sensitivity: Mothers' comments on infants' mental processes predict security of attachment at 12 months. *Journal of Child Psychology and Psychiatry, 42*(5), 637-648. doi: http://dx.doi.org/10.1111/1469-7610.00759

Meins, E., Fernyhough, C., Russell, J., & Clark-Carter, D. (1998). Security of attachment as a predictor of symbolic and mentalising abilities: A longitudinal study. *Social Development, 7*(1), 1-24. doi: http://dx.doi.org/10.1111/1467-9507.00047

Meins, E., Fernyhough, C., Wainwright, R., Gupta, M. D., Fradley, E., & Tuckey, M. (2002). Maternal mind-mindedness and attachment security as predictors of theory of mind understanding. *Child Development, 73*(6), 1715-1726. doi: http://dx.doi.org/10.1111/1467-8624.00501

Mikulincer, M., & Shaver, P. R. (2007). *Attachment in adulthood: Structure, dynamics, and change*. New York, NY: Guilford Press; US.

Minde, K., & Hesse, E. (1996). The role of the adult attachment interview in parent-infant psychotherapy: A case presentation. *Infant Mental Health Journal, 17*(2), 115-126. doi: http://dx.doi.org/10.1002/%28SICI%291097-0355%28199622%2917:2%3C115::AID-IMHJ2%3E3.0.CO;2-P

Morris, J., Friston, K., Buchel, C., Frith, C., Young, A., Calder, A., & Dolan, R. (1998). A neuromodulatory role for the human amygdala in processing

emotional facial expressions. *Brain: A Journal of Neurology, 121*(1), 47-57. doi: http://dx.doi.org/10.1093/brain/121.1.47

Moss, E., Dubois-Comtois, K., Cyr, C., Tarabulsy, G. M., St-Laurent, D., & Bernier, A. (2011). Efficacy of a home-visiting intervention aimed at improving maternal sensitivity, child attachment, and behavioral outcomes for maltreated children: A randomized control trial. *Development and Psychopathology, 23*(1), 195-210. doi: http://dx.doi.org/10.1017/S0954579410000738

Murray, L., Arteche, A., Fearon, P., Halligan, S., Goodyer, I., & Cooper, P. (2011). Maternal postnatal depression and the development of depression in offspring up to 16 years of age. *Journal of the American Academy of Child & Adolescent Psychiatry, 50*(5), 460-470. doi: http://dx.doi.org/10.1016/j.jaac.2011.02.001

Nachmias, M., Gunnar, M., Mangelsdorf, S., Parritz, R. H., & Buss, K. (1996). Behavioral inhibition and stress reactivity: The moderating role of attachment security. *Child Development, 67*(2), 508-522. doi: http://dx.doi.org/10.2307/1131829

Narusyte, J., Neiderhiser, J. M., D'Onofrio, B. M., Reiss, D., Spotts, E. L., Ganiban, J., & Lichtenstein, P. (2008). Testing different types of genotype-environment correlation: An extended children-of-twins model. *Developmental Psychology, 44*(6), 1591-1603. doi: http://dx.doi.org/10.1037/a0013911

NICHD Early Child Care Research Network. (2001). Child-care and family predictors of preschool attachment and stability from infancy. *Developmental Psychology, 37*(6), 847-862. doi: http://dx.doi.org/10.1037/0012-1649.37.6.847

NICHD Early Child Care Research Network. (2006). Infant-mother attachment classification: Risk and protection in relation to changing maternal caregiving quality. *Developmental Psychology, 42*(1), 38-58. doi: Doi 10.1037/0012-1649.42.1.38

Nye, E. C., Katzman, J., Bell, J. B., Kilpatrick, J., Brainard, M., & Haaland, K. Y. (2008). Attachment organization in Vietnam combat veterans with posttraumatic stress disorder. *Attachment & Human Development, 10*(1), 41-57. doi: http://dx.doi.org/10.1080/14616730701868613

O'Connor, T. G., Croft, C., & Steele, H. (2000). The contributions of behavioural genetic studies to attachment theory. *Attachment & human development, 2*(1), 107-122. doi: 10.1080/146167300361345

O'Connor, T. G., & Croft, C. M. (2001). A twin study of attachment in preschool children. *Child Development, 72*(5), 1501-1511. doi: http://dx.doi.org/10.1111/1467-8624.00362

O'Connor, T. G., & Zeanah, C. H. (2003). Attachment disorders: Assessment strategies and treatment approaches. *Attachment & Human Development, 5*(3), 223-244. doi: http://dx.doi.org/10.1080/1461673031000159397 4

Oosterman, M., & Schuengel, C. (2007). Physiological effects of separation and reunion in relation to attachment and temperament in young children. *Developmental Psychobiology*, *49*(2), 119-128. doi: http://dx.doi.org/10.1002/dev.20207

Oppenheim, D. (1997). The attachment doll-play interview for preschoolers. *International Journal of Behavioral Development, 20*(4), 681-697. doi: http://dx.doi.org/10.1080/016502597385126

Oppenheim, D. (2006). Child, parent, and parent-child emotion narratives: Implications for developmental psychopathology. *Development and Psychopathology, 18*(3), 771-790. doi: http://dx.doi.org/10.1017/S095457940606038X

Oppenheim, D., Koren-Karie, N., & Sagi, A. (2001). Mothers' empathic understanding of their preschoolers' internal experience: Relations with early attachment. *International Journal of Behavioral Development, 25*(1), 16-26. doi: http://dx.doi.org/10.1080/01650250042000096

Oppenheim, D., Koren-Karie, N., & Sagi-Schwartz, A. (2007). Emotion Dialogues Between Mothers and Children at 4.5 and 7.5 Years: Relations With Children's Attachment at 1 Year. *Child Development, 78*(1), 38-52. doi: http://dx.doi.org/10.1111/j.1467-8624.2007.00984.x

Ortiz, J., & Raine, A. (2004). Heart Rate Level and Antisocial Behavior in Children and Adolescents: A Meta-Analysis. *Journal of the American Academy of Child & Adolescent Psychiatry, 43*(2), 154-162. doi: http://dx.doi.org/10.1097/00004583-200402000-00010

Out, D., Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2009). The role of disconnected and extremely insensitive parenting in the development of disorganized attachment: Validation of a new measure. *Attachment & Human Development, 11*(5), 419-443. doi: http://dx.doi.org/10.1080/14616730903132289

Owen, M. T., Easterbrooks, M., Chase-Lansdale, L., & Goldberg, W. A. (1984). The relation between maternal employment status and the stability of attachments to mother and to father. *Child Development, 55*(5), 1894-1901. doi: http://dx.doi.org/10.2307/1129936

Panfile, T. M., & Laible, D. J. (2012). Attachment security and child's empathy: The mediating role of emotion regulation. *Merrill-Palmer Quarterly, 58*(1), 1-21. doi: http://dx.doi.org/10.1353/mpq.2012.0003

Pederson, D. R., Moran, G., Sitko, C., Campbell, K., Ghesquire, K., & Acton, H. (1990). Maternal sensitivity and the security of infant-mother attachment: A Q-sort study. *Child Development, 61*(6), 1974-1983. doi: http://dx.doi.org/10.2307/1130851

Pianta, R. C., Egeland, B., & Adam, E. K. (1996). Adult attachment classification and self-reported psychiatric symptomatology as assessed by the Minnesota Multiphasic Personality Inventory--2. *Journal of Consulting and Clinical Psychology, 64*(2), 273-281. doi: http://dx.doi.org/10.1037/0022-006X.64.2.273

Picardi, A., Fagnani, C., Nistico, L., & Stazi, M. A. (2011). A twin study of attachment style in young adults. *Journal of Personality, 79*(5), 965-991. doi: http://dx.doi.org/10.1111/j.1467-6494.2010.00707.x

Pillay, S. S., Gruber, S. A., Rogowska, J., Simpson, N., & Yurgelun-Todd, D. A. (2006). fMRI of fearful facial affect recognition in panic disorder: The cingulate gyrus-amygdala connection. *Journal of Affective Disorders, 94*(1-3), 173-181. doi: http://dx.doi.org/10.1016/j.jad.2006.04.007

Pinquart, M., Feusner, C., & Ahnert, L. (2013). Meta-analytic evidence for stability in attachments from infancy to early adulthood. *Attachment & Human Development, 15*(2), 189-218. doi: http://dx.doi.org/10.1080/14616734.2013.746257

Plomin, R., DeFries, J. C., Knopik, V. S., & Neiderhiser, J. M. (2013). *Behavioral Genetics* (6th ed.). New York: Worth Publishers.

Ponizovsky, A. M., Nechamkin, Y., & Rosca, P. (2007). Attachment patterns are associated with symptomatology and course of schizophrenia in male inpatients. *American Journal of Orthopsychiatry, 77*(2), 324-331. doi: http://dx.doi.org/10.1037/0002-9432.77.2.324

Ponizovsky, A. M., Vitenberg, E., Baumgarten-Katz, I., & Grinshpoon, A. (2013). Attachment styles and affect regulation among outpatients with schizophrenia: Relationships to symptomatology and emotional distress. *Psychology and Psychotherapy: Theory, Research and Practice, 86*(2), 164-182. doi: http://dx.doi.org/10.1111/j.2044-8341.2011.02054.x

Poslawsky, I. E., Naber, F. B. A., Bakermans-Kranenburg, M. J., De Jonge, M. V., Van Engeland, H., & Van IJzendoorn, M. H. (in press). Development of a Video feedback Intervention to promote Positive Parenting for Children with Autism (VIPP-AUTI). *Attachment & Human Development*.

Raby, K., Cicchetti, D., Carlson, E. A., Cutuli, J., Englund, M. M., & Egeland, B. (2012). Genetic and caregiving-based contributions to infant attachment: Unique associations with distress reactivity and attachment security. *Psychological Science, 23*(9), 1016-1023. doi: http://dx.doi.org/10.1177/0956797612438265

Raikes, H., & Thompson, R. A. (2006). Family emotional climate, attachment security and young children's emotion knowledge in a high risk sample. *British Journal of Developmental Psychology, 24*(1), 89-104. doi: http://dx.doi.org/10.1348/026151005X70427

Raikes, H., & Thompson, R. A. (2008). Attachment security and parenting quality predict children's problem-solving, attributions, and loneliness with peers.

Attachment & Human Development, 10(3), 319-344. doi: http://dx.doi.org/10.1080/14616730802113620

Rauch, S. L., Whalen, P. J., Shin, L. M., McInerney, S. C., Macklin, M. L., Lasko, N. B., . . . Pitman, R. K. (2000). Exaggerated amygdala response to masked facial stimuli in posttraumatic stress disorder: A functional MRI study. *Biological Psychiatry, 47*(9), 769-776. doi: http://dx.doi.org/10.1016/S0006-3223%2800%2900828-3

Repacholi, B., & Trapolini, T. (2004). Attachment and preschool children's understanding of maternal versus non-maternal psychological states. *British Journal of Developmental Psychology, 22*(3), 395-415. doi: http://dx.doi.org/10.1348/0261510041552693

Richters, J. E., Waters, E., & Vaughn, B. E. (1988). Empirical classification of infant-mother relationships from interactive behavior and crying during reunion. *Child Development, 59*(2), 512-522. doi: http://dx.doi.org/10.2307/1130329

Riem, M. M., Bakermans-Kranenburg, M. J., Pieper, S., Tops, M., Boksem, M. A., Vermeiren, R. R., . . . Rombouts, S. A. (2011). Oxytocin modulates amygdala, insula, and inferior frontal gyrus responses to infant crying: A randomized controlled trial. *Biological Psychiatry, 70*(3), 291-297. doi: http://dx.doi.org/10.1016/j.biopsych.2011.02.006

Riem, M. M., van IJzendoorn, M. H., Tops, M., Boksem, M. A., Rombouts, S. A., & Bakermans-Kranenburg, M. J. (2012). No laughing matter: Intranasal oxytocin administration changes functional brain connectivity during exposure to infant laughter. *Neuropsychopharmacology, 37*(5), 1257-1266. doi: http://dx.doi.org/10.1038/npp.2011.313

Riggs, S. A., Paulson, A., Tunnell, E., Sahl, G., Atkison, H., & Ross, C. A. (2007). Attachment, personality, and psychopathology among adult inpatients: Self-reported romantic attachment style versus Adult Attachment Interview states of mind. *Development and Psychopathology, 19*(1), 263-291. doi: http://dx.doi.org/10.1017/S0954579407070149

Roisman, G. I. (2007). The psychophysiology of adult attachment relationships: Autonomic reactivity in marital and premarital interactions. *Developmental Psychology, 43*(1), 39-53. doi: http://dx.doi.org/10.1037/0012-1649.43.1.39

Roisman, G. I., & Fraley, R. C. (2008). A behavior-genetic study of parenting quality, infant attachment security, and their covariation in a nationally representative sample. *Developmental Psychology, 44*(3), 831-839. doi: http://dx.doi.org/10.1037/0012-1649.44.3.831

Roisman, G. I., Fraley, R. C., & Belsky, J. (2007). A taxometric study of the Adult Attachment Interview. *Developmental Psychology, 43*(3), 675-686. doi: http://dx.doi.org/10.1037/0012-1649.43.3.675

Roisman, G. I., & Haydon, K. C. (2011). Earned-security in retrospect: Emerging insights from longitudinal, experimental, and taxometric investigations *The origins and organization of adaptation and maladaptation* (pp. 109-154). Hoboken, NJ: John Wiley & Sons Inc; US.

Roisman, G. I., Holland, A., Fortuna, K., Fraley, R. C., Clausell, E., & Clarke, A. (2007). The Adult Attachment Interview and self-reports of attachment style: An empirical rapprochement. *Journal of Personality and Social Psychology, 92*(4), 678-697. doi: http://dx.doi.org/10.1037/0022-3514.92.4.678

Roisman, G. I., Tsai, J. L., & Chiang, K. H. (2004). The emotional integration of childhood experience: physiological, facial expressive, and self-reported

emotional response during the adult attachment interview. *Developmental psychology, 40*(5), 776-789. doi: 10.1037/0012-1649.40.5.776

Rosenthal, M. K. (1973). Attachment and mother-infant interaction: Some research impasse and a suggested change in orientation. *Child Psychology & Psychiatry & Allied Disciplines, 14*(3), 201-207. doi: http://dx.doi.org/10.1111/j.1469-7610.1973.tb01187.x

Rothbaum, F., Rosen, K. S., Pott, M., & Beatty, M. (1995). Early parent-child relationships and later problem behavior: A longitudinal study. *Merrill-Palmer Quarterly, 41*(2), 133-151.

Rutter, M. (1979). Protective factors in children's responses to stress and disadvantage. In M. W. Kent & J. E. Rolf (Eds.), *Primary prevention in psychopathology: Social competence in children* (pp. 49-74). Hanover, NH: University Press of New England.

Rutter, M., Kreppner, J., & Sonuga-Barke, E. (2009). Emanuel Miller lecture: Attachment insecurity, disinhibited attachment, and attachment disorders: Where do research findings leave the concepts? *Journal of Child Psychology and Psychiatry, 50*(5), 529-543. doi: http://dx.doi.org/10.1111/j.1469-7610.2009.02042.x

Rutter, M., & Sroufe, L. A. (2000). Developmental psychopathology: Concepts and challenges. *Development and Psychopathology, 12*(3), 265-296. doi: http://dx.doi.org/10.1017/S0954579400003023

Sabatini, M. J., Ebert, P., Lewis, D. A., Levitt, P., Cameron, J. L., & Mirnics, K. (2007). Amygdala gene expression correlates of social behavior in monkeys experiencing maternal separation. *J Neurosci, 27*(12), 3295-3304. doi: 10.1523/JNEUROSCI.4765-06.2007

Sanders, M. R., Markie-Dadds, C., & Turner, K. M. (2003). *Theoretical, scientific and clinical foundations of the Triple P-Positive Parenting Program: A population approach to the promotion of parenting competence* (Vol. 1): Queensland: Parenting and Family Support Centre, The University of Queensland.

Schank, R. C., & Abelson, R. P. (1988). Scripts, plans, goals, and understanding *Readings in cognitive science: A perspective from psychology and artificial intelligence* (pp. 190-223). San Mateo, CA: Morgan Kaufmann; US.

Schieche, M., & Spangler, G. (2005). Individual Differences in Biobehavioral Organization During Problem-Solving in Toddlers: The Influence of Maternal Behavior, Infant-Mother Attachment, and Behavioral Inhibition on the Attachment-Exploration Balance. *Developmental Psychobiology, 46*(4), 293-306. doi: http://dx.doi.org/10.1002/dev.20065

Schneider, B. H., Atkinson, L., & Tardif, C. (2001). Child-parent attachment and children's peer relations: A quantitative review. *Developmental Psychology, 37*(1), 86-100. doi: http://dx.doi.org/10.1037/0012-1649.37.1.86

Schore, A. N. (2001). Effects of a secure attachment relationship on right brain development, affect regulation, and infant mental health. *Infant Mental Health Journal, 22*(1-2), 7-66. doi: http://dx.doi.org/10.1002/1097-0355%28200101/04%2922:1%3C7::AID-IMHJ2%3E3.0.CO;2-N

Schuengel, C., Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (1999). Frightening maternal behavior linking unresolved loss and disorganized infant attachment. *Journal of Consulting and Clinical Psychology, 67*(1), 54-63. doi: http://dx.doi.org/10.1037/0022-006X.67.1.54

Scott, S., & O'Connor, T. G. (2012). An experimental test of differential susceptibility to parenting among emotionally-dysregulated children in a randomized controlled trial for oppositional behavior. *Journal of Child Psychology and Psychiatry, 53*(11), 1184-1193. doi: http://dx.doi.org/10.1111/j.1469-7610.2012.02586.x

Seifritz, E., Esposito, F., Neuhoff, J. G., Luthi, A., Mustovic, H., Dammann, G., . . . Di Salle, F. (2003). Differential sex-independent amygdala response to infant crying and laughing in parents versus nonparents. *Biological Psychiatry, 54*(12), 1367-1375. doi: http://dx.doi.org/10.1016/S0006-3223%2803%2900697-8

Shaver, P. R., & Mikulincer, M. (2002). Attachment-related psychodynamics. *Attachment & Human Development, 4*(2), 133-161. doi: http://dx.doi.org/10.1080/14616730210154171

Shaw, D. S., Keenan, K., Vondra, J. I., Delliquadri, E., & Giovannelli, J. (1997). Antecedents of preschool children's internalizing problems: A longitudinal study of low-income families. *Journal of the American Academy of Child & Adolescent Psychiatry, 36*(12), 1760-1767. doi: http://dx.doi.org/10.1097/00004583-199712000-00025

Shaw, D. S., & Vondra, J. I. (1995). Infant attachment security and maternal predictors of early behavior problems: A longitudinal study of low-income families. *Journal of Abnormal Child Psychology, 23*(3), 335-357. doi: http://dx.doi.org/10.1007/BF01447561

Sherman, L. J., Stupica, B., Dykas, M. J., Ramos-Marcuse, F., & Cassidy, J. (2013). The development of negative reactivity in irritable newborns as a function of

attachment. *Infant Behavior & Development, 36*(1), 139-146. doi: http://dx.doi.org/10.1016/j.infbeh.2012.11.004

Shmueli-Goetz, Y., Target, M., Fonagy, P., & Datta, A. (2008). The Child Attachment Interview: A psychometric study of reliability and discriminant validity. *Developmental Psychology, 44*(4), 939-956. doi: http://dx.doi.org/10.1037/0012-1649.44.4.939

Shrout, P. E., & Fleiss, J. L. (1979). Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin, 86*(2), 420-428. doi: http://dx.doi.org/10.1037/0033-2909.86.2.420

Simpson, J. A., & Belsky, J. (2008). Attachment theory within a modern evolutionary framework *Handbook of attachment: Theory, research, and clinical applications* (2nd ed., pp. 131-157). New York, NY: Guilford Press; US.

Slade, A. (2005). Parental reflective functioning: An introduction. *Attachment & Human Development, 7*(3), 269-281. doi: http://dx.doi.org/10.1080/14616730500245906

Slade, A., Grienenberger, J., Bernbach, E., Levy, D., & Locker, A. (2005). Maternal reflective functioning, attachment, and the transmission gap: A preliminary study. *Attachment & Human Development, 7*(3), 283-298. doi: http://dx.doi.org/10.1080/14616730500245880

Slough, N. M., & Greenberg, M. T. (1990). Five-year-olds' representations of separation from parents: Responses from the perspective of self and other. *New Directions for Child Development, 48*, 67-84. doi: http://dx.doi.org/10.1002/cd.23219904806

Smith, P. B., & Pederson, D. R. (1988). Maternal sensitivity and patterns of infant-mother attachment. *Child Development, 59*(4), 1097-1101. doi: http://dx.doi.org/10.2307/1130276

Solomon, J., & George, C. (2008). The measurement of attachment security and related constructs in infancy and early childhood *Handbook of attachment: Theory, research, and clinical applications* (2nd ed., pp. 383-416). New York, NY: Guilford Press; US.

Spangler, G., & Grossmann, K. (1993). Biobehavioral organization in securely and insecurely attached infants. *Child Development, 64*(5), 1439-1450. doi: http://dx.doi.org/10.2307/1131544

Spangler, G., Johann, M., Ronai, Z., & Zimmermann, P. (2009). Genetic and environmental influence on attachment disorganization. *Journal of Child Psychology and Psychiatry, 50*(8), 952-961. doi: http://dx.doi.org/10.1111/j.1469-7610.2008.02054.x

Spangler, G., & Schieche, M. (1998). Emotional and adrenocortical responses of infants to the strange situation: The differential function of emotional expression. *International Journal of Behavioral Development, 22*(4), 681-706. doi: http://dx.doi.org/10.1080/016502598384126

Sroufe, L. A. (1979). The coherence of individual development: Early care, attachment, and subsequent developmental issues. *American Psychologist, 34*(10), 834-841. doi: http://dx.doi.org/10.1037/0003-066X.34.10.834

Sroufe, L. A. (1988). The role of infant-caregiver attachment in development *Clinical implications of attachment* (pp. 18-38). Hillsdale, NJ, England: Lawrence Erlbaum Associates, Inc; England.

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

Sroufe, L. A. (2003). Attachment categories as reflections of multiple dimensions: Comment on Fraley and Spieker (2003). *Developmental Psychology, 39*(3), 413-416. doi: http://dx.doi.org/10.1037/0012-1649.39.3.413

Sroufe, L. A., Egeland, B., Carlson, E., & Collins, W. A. (2005a). Placing Early Attachment Experiences in Developmental Context: The Minnesota Longitudinal Study *Attachment from infancy to adulthood: The major longitudinal studies* (pp. 48-70). New York, NY: Guilford Publications; US.

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

Sroufe, L. A., Egeland, B., & Kreutzer, T. (1990). The fate of early experience following developmental change: Longitudinal approaches to individual adaptation in childhood. *Child Development, 61*(5), 1363-1373. doi: http://dx.doi.org/10.2307/1130748

Sroufe, L. A., Erickson, M. F., & Friedrich, W. N. (2002). Attachment theory and "attachment therapy". *APSAC Advisor*(14), 4-6.

Sroufe, L. A., & Waters, E. (1977). Attachment as an organizational construct. *Child Development, 48*(4), 1184-1199. doi: http://dx.doi.org/10.2307/1128475

Stalker, C. A., & Davies, F. (1998). Working models of attachment and representations of the object in a clinical sample of sexually abused women. *Bulletin of the Menninger Clinic, 62*(3), 334-335.

Steele, H., & Steele, M. (2005). Understanding and Resolving Emotional Conflict: The London Parent-Child Project *Attachment from infancy to adulthood: The*

major longitudinal studies (pp. 137-164). New York, NY: Guilford Publications; US.

Steele, H., Steele, M., & Croft, C. (2008). Early attachment predicts emotion recognition at 6 and 11 years old. *Attachment & Human Development, 10*(4), 379-393. doi: http://dx.doi.org/10.1080/14616730802461409

Steele, H., Steele, M., Croft, C., & Fonagy, P. (1999). Infant-mother attachment at one year predicts children's understanding of mixed emotions at six years. *Social Development, 8*(2), 161-178. doi: http://dx.doi.org/10.1111/1467-9507.00089

Steele, H., Steele, M., & Murphy, A. (2009). Use of the adult attachment interview to measure process and change in psychotherapy. *Psychotherapy Research, 19*(6), 633-643. doi: http://dx.doi.org/10.1080/10503300802609698

Stein, A., Woolley, H., Senior, R., Hertzmann, L., Lovel, M., Lee, J., . . . Fairburn, C. G. (2006). Treating Disturbances in the Relationship Between Mothers With Bulimic Eating Disorders and Their Infants: A Randomized, Controlled Trial of Video Feedback. *The American Journal of Psychiatry*, *163*(5), 899-906. doi: http://dx.doi.org/10.1176/appi.ajp.163.5.899

Stein, J. L., Wiedholz, L. M., Bassett, D. S., Weinberger, D. R., Zink, C. F., Mattay, V. S., & Meyer-Lindenberg, A. (2007). A validated network of effective amygdala connectivity. *Neuroimage, 36*(3), 736-745. doi: 10.1016/j.neuroimage.2007.03.022

Stevenson-Hinde, J., & Marshall, P. J. (1999). Behavioral inhibition, heart period, and respiratory sinus arrhythmia: An attachment perspective. *Child Development, 70*(4), 805-816. doi: http://dx.doi.org/10.1111/1467-8624.00058

Stolk, M. N., Mesman, J., van Zeijl, J., Alink, L. R., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., . . . Koot, H. M. (2008). Early parenting intervention aimed at maternal sensitivity and discipline: A process evaluation. *Journal of Community Psychology, 36*(6), 780-797. doi: http://dx.doi.org/10.1002/jcop.20280

Stovall-McClough, K., & Cloitre, M. (2006). Unresolved attachment, PTSD, and dissociation in women with childhood abuse histories. *Journal of Consulting and Clinical Psychology, 74*(2), 219-228. doi: http://dx.doi.org/10.1037/0022-006X.74.2.219

Stovall-McClough, K. C., & Cloitre, M. (2003). Reorganization of unresolved childhood traumatic memories following exposure therapy. *Ann N Y Acad Sci, 1008*, 297-299.

Strathearn, L., Fonagy, P., Amico, J., & Montague, P. (2009). Adult attachment predicts maternal brain and oxytocin response to infant cues. *Neuropsychopharmacology, 34*(13), 2655-2666. doi: http://dx.doi.org/10.1038/npp.2009.103

Suess, G., Grossmann, K., & Sroufe, L. A. (1992). Effects of infant attachment to mother and father on quality of adaptation in preschool: From dyadic to individual organisation of self. *International Journal of Behavioral Development, 15*(1), 43-65.

Suomi, S. J. (2003). Gene-Environment Interactions and the Neurobiology of Social Conflict *Roots of mental illness in children* (pp. 132-139). New York, NY: New York Academy of Sciences; US.

Swain, J. E. (2011). The human parental brain: In vivo neuroimaging. *Progress in Neuro-Psychopharmacology & Biological Psychiatry, 35*(5), 1242-1254. doi: http://dx.doi.org/10.1016/j.pnpbp.2010.10.017

Swain, J. E., & Ho, S. (2010). Baby smile response circuits of the parental brain. *Behavioral and Brain Sciences, 33*(6), 460-461. doi: http://dx.doi.org/10.1017/S0140525X10001615

Symons, D. K., & Clark, S. E. (2000). A longitudinal study of mother-child relationships and theory of mind in the preschool period. *Social Development, 9*(1), 3-23. doi: http://dx.doi.org/10.1111/1467-9507.00108

Tarabulsy, G. M., Pascuzzo, K., Moss, E., St-Laurent, D., Bernier, A., Cyr, C., & Dubois-Comtois, K. (2008). Attachment-based intervention for maltreating families. *American Journal of Orthopsychiatry, 78*(3), 322-332. doi: http://dx.doi.org/10.1037/a0014070

Teti, D. M., & Ablard, K. E. (1989). Security of attachment and infant-sibling relationships: A laboratory study. *Child Development, 60*(6), 1519-1528. doi: http://dx.doi.org/10.2307/1130940

Thompson, R. A., Lamb, M. E., & Estes, D. (1982). Stability of infant-mother attachment and its relationship to changing life circumstances in an unselected middle-class sample. *Child Development, 53*(1), 144-148. doi: http://dx.doi.org/10.2307/1129646

Tomlinson, M., Cooper, P., & Murray, L. (2005). The Mother-Infant Relationship and Infant Attachment in a South African Peri-Urban Settlement. *Child Development, 76*(5), 1044-1054. doi: http://dx.doi.org/10.1111/j.1467-8624.2005.00896.x

Toth, S. L., Rogosch, F. A., & Cicchetti, D. (2008). Attachment theory-informed intervention and reflection functioning in depressed mothers. In H. Steele & M. Steele (Eds.), *Clinical applications of the Adult Attachment Interview* (pp. 154-172). New York: Guildford Press.

Toth, S. L., Rogosch, F. A., Manly, J. T., & Cicchetti, D. (2006). The efficacy of toddler-parent psychotherapy to reorganize attachment in the young offspring of mothers with major depressive disorder: A randomized preventive trial. *Journal of Consulting and Clinical Psychology, 74*(6), 1006-1016. doi: http://dx.doi.org/10.1037/0022-006X.74.6.1006

Tottenham, N., Hare, T., Millner, A., Gilhooly, T., Zevin, J., & Casey, B. (2011). Elevated amygdala response to faces following early deprivation. *Developmental Science, 14*(2), 190-204.

Trouton, A., Spinath, F. M., & Plomin, R. (2002). Twins Early Development Study (TEDS): A Multivariate, Longitudinal Genetic Investigation of Language, Cognition and Behavior Problems in Childhood. *Twin Research, 5*(5), 444-448. doi: http://dx.doi.org/10.1375/136905202320906255

True, M. M., Pisani, L., & Oumar, F. (2001). Infant-mother attachment among the Dogon of Mali. *Child Development, 72*(5), 1451-1466. doi: http://dx.doi.org/10.1111/1467-8624.00359

Tyrrell, C., & Dozier, M. (1997). *The role of attachment in the therapeutic process and outcome for adults with serious psychiatric disorders*: Paper presented at the biennial meeting of the Society for Research in Child Development, Washington, DC.

Tyrrell, C. L., Dozier, M., Teague, G. B., & Fallot, R. D. (1999). Effective treatment relationships for persons with serious psychiatric disorders: The importance of

attachment states of mind. *Journal of Consulting and Clinical Psychology, 67*(5), 725-733. doi: http://dx.doi.org/10.1037/0022-006X.67.5.725

Uher, R., & McGuffin, P. (2010). The moderation by the serotonin transporter gene of environmental adversity in the etiology of depression: 2009 update. *Molecular Psychiatry, 15*(1), 18-22. doi: http://dx.doi.org/10.1038/mp.2009.123

Urban, J., Carlson, E., Egeland, B., & Sroufe, L. A. (1991). Patterns of individual adaptation across childhood. *Development and Psychopathology, 3*(4), 445-460. doi: http://dx.doi.org/10.1017/S0954579400007628

van Bakel, H. J., & Riksen-Walraven, J. (2004). Stress Reactivity in 15-Month-Old Infants: Links with Infant Temperament, Cognitive Competence, and Attachment Security. *Developmental Psychobiology, 44*(3), 157-167. doi: http://dx.doi.org/10.1002/dev.20001

van den Boom, D. (1990). Preventive intervention and the quality of mother-infant interaction and infant exploration in irritable infants. In W. Koops & e. al. (Eds.), *Developmental Psychology Behind the Dikes* (pp. 249-270). Amsterdam: Eburon.

van den Boom, D. C. (1994). The influence of temperament and mothering on attachment and exploration: An experimental manipulation of sensitive responsiveness among lower-class mothers with irritable infants. *Child Development, 65*(5), 1457-1477.

van der Horst, F. C., & van der Veer, R. (2010). The ontogeny of an idea: John Bowlby and contemporaries on mother-child separation. *History of Psychology, 13*(1), 25-45. doi: http://dx.doi.org/10.1037/a0017660

Van Dijken, S. (1998). *John Bowlby, his early life: a biographical journey into the roots of attachment theory*: Free Assn Books.

van IJzendoorn, M. H. (1995). Adult attachment representations, parental responsiveness, and infant attachment: A meta-analysis on the predictive validity of the Adult Attachment Interview. *Psychological Bulletin, 117*(3), 387-403. doi: http://dx.doi.org/10.1037/0033-2909.117.3.387

van IJzendoorn, M. H. (1997). Attachment, emergent morality, and aggression: Toward a developmental socioemotional model of antisocial behaviour. *International Journal of Behavioral Development, 21*(4), 703-727. doi: http://dx.doi.org/10.1080/016502597384631

van IJzendoorn, M. H., & Bakermans-Kranenburg, M. J. (2006). DRD47-repeat polymorphism moderates the association between maternal unresolved loss or trauma and infant disorganization. *Attachment & Human Development, 8*(4), 291-307. doi: http://dx.doi.org/10.1080/14616730601048159

van IJzendoorn, M. H., & Bakermans-Kranenburg, M. J. (2012). Integrating temperament and attachment: The differential susceptibility paradigm *Handbook of temperament* (pp. 403-424). New York, NY: Guilford Press; US.

van IJzendoorn, M. H., Feldbrugge, J., Derks, F., de Ruiter, C., Verhagen, M., Philipse, M., . . . Riksen-Walraven, J. (1997). Attachment representations of personality-disordered criminal offenders. *American Journal of Orthopsychiatry, 67*(3), 449-459. doi: http://dx.doi.org/10.1037/h0080246

van IJzendoorn, M. H., Juffer, F., & Duyvesteyn, M. G. (1995). Breaking the intergenerational cycle of insecure attachment: A review of the effects of attachment-based interventions on maternal sensitivity and infant security. *Child Psychology & Psychiatry & Allied Disciplines, 36*(2), 225-248. doi: http://dx.doi.org/10.1111/j.1469-7610.1995.tb01822.x

van IJzendoorn, M. H., Moran, G., Belsky, J., Pederson, D., Bakermans-Kranenburg, M. J., & Kneppers, K. (2000). The similarity of siblings' attachments to their mother. *Child Development, 71*(4), 1086-1098. doi: http://dx.doi.org/10.1111/1467-8624.00211

van IJzendoorn, M. H., Palacios, J., Sonuga-Barke, E. J., Gunnar, M. R., Vorria, P., McCall, R. B., . . . Juffer, F. (2011). Children without permanent parents: Research, practice, and policy: I. Children in institutional care: Delayed development and resilience. *Monographs of the Society for Research in Child Development, 76*(4), 8-30. doi: http://dx.doi.org/10.1111/j.1540-5834.2011.00626.x

van IJzendoorn, M. H., & Sagi, A. (1999). Cross-cultural patterns of attachment: Universal and contextual dimensions *Handbook of attachment: Theory, research, and clinical applications* (pp. 713-734). New York, NY: Guilford Press; US.

van IJzendoorn, M. H., Schuengel, C., & Bakermans-Kranenburg, M. J. (1999). Disorganized attachment in early childhood: Meta-analysis of precursors, concomitants, and sequelae. *Development and Psychopathology, 11*(2), 225-249. doi: http://dx.doi.org/10.1017/S0954579499002035

van IJzendoorn, M. H., Vereijken, C. M., Bakermans-Kranenburg, M. J., & Riksen-Walraven, J. (2004). Assessing Attachment Security With the Attachment Q Sort: Meta-Analytic Evidence for the Validity of the Observer AQS. *Child Development, 75*(4), 1188-1213. doi: http://dx.doi.org/10.1111/j.1467-8624.2004.00733.x

Van Ryzin, M. J., Carlson, E. A., & Sroufe, L. A. (2011). Attachment discontinuity in a high-risk sample. *Attachment & Human Development, 13*(4), 381-401. doi: http://dx.doi.org/10.1080/14616734.2011.584403

Van Zeijl, J., Mesman, J., van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., Juffer, F., Stolk, M. N., . . . Alink, L. R. (2006). Attachment-based intervention for enhancing sensitive discipline in mothers of 1- to 3-year-old children at risk for externalizing behavior problems: A randomized controlled trial. *Journal of Consulting and Clinical Psychology, 74*(6), 994-1005. doi: http://dx.doi.org/10.1037/0022-006X.74.6.994

Vaughn, B. E., Bost, K. K., & van IJzendoorn, M. H. (2008). Attachment and temperament: Additive and interactive influences on behavior, affect, and cognition during infancy and childhood *Handbook of attachment: Theory, research, and clinical applications* (2nd ed., pp. 192-216). New York, NY: Guilford Press; US.

Vaughn, B. E., Egeland, B. R., Sroufe, L. A., & Waters, E. (1979). Individual differences in infant-mother attachment at twelve and eighteen months: Stability and change in families under stress. *Child Development, 50*(4), 971-975. doi: http://dx.doi.org/10.2307/1129321

Verhage, M. L., Schuengel, C., J., B.-K. M., Oosterman, M., Madigan, S., Fearon, R. M. P., . . . van IJzendoorn, M. H. (2013). *Intergenerational transmission of attachment: Preliminary meta-analytic results*: Poster presented at the ISED Research Days, Amsterdam: The Netherlands.

Verissimo, M., & Salvaterra, F. (2006). Maternal secure-base scripts and children's attachment security in an adopted sample. *Attachment & Human Development, 8*(3), 261-273. doi: http://dx.doi.org/10.1080/14616730600856149

Verschueren, K., Dossche, D., Marcoen, A., Mahieu, S., & Bakermans-Kranenburg, M. (2006). Attachment Representations and Discipline in Mothers of Young School Children: An Observation Study. *Social Development, 15*(4), 659-675. doi: http://dx.doi.org/10.1111/j.1467-9507.2006.00363.x

Vuga, M., Fox, N. A., Cohn, J. F., Kovacs, M., & George, C. J. (2008). Long-term stability of electroencephalographic asymmetry and power in 3 to 9 year-old children. *International Journal of Psychophysiology, 67*(1), 70-77. doi: http://dx.doi.org/10.1016/j.ijpsycho.2007.10.007

Ward, M. J., Vaughn, B. E., & Robb, M. D. (1988). Social-emotional adaptation and infant-mother attachment in siblings: Role of the mother in cross-sibling consistency. *Child Development, 59*(3), 643-651. doi: http://dx.doi.org/10.2307/1130564

Wartner, U. G., Grossmann, K., Fremmer-Bombik, E., & Suess, G. (1994). Attachment patterns at age six in south Germany: Predictability from infancy and implications for preschool behavior. *Child Development, 65*(4), 1014-1027. doi: http://dx.doi.org/10.2307/1131301

Waters, E. (1978). The reliability and stability of individual differences in infant-mother attachment. *Child Development, 49*(2), 483-494. doi: http://dx.doi.org/10.2307/1128714

Waters, E., & Deane, K. E. (1985). Defining and assessing individual differences in attachment relationships: Q-methodology and the organization of behavior in infancy and early childhood. *Monographs of the Society for Research in Child Development, 50*(1-2), 41-65. doi: http://dx.doi.org/10.2307/3333826

Waters, E., Merrick, S., Treboux, D., Crowell, J., & Albersheim, L. (2000). Attachment security in infancy and early adulthood: A twenty-year

longitudinal study. *Child Development, 71*(3), 684-689. doi: http://dx.doi.org/10.1111/1467-8624.00176

Waters, E., Weinfield, N. S., & Hamilton, C. E. (2000). The stability of attachment security from infancy to adolescence and early adulthood: General discussion. *Child Development, 71*(3), 703-706. doi: http://dx.doi.org/10.1111/1467-8624.00179

Waters, H. S., & Rodrigues-Doolabh, L. (2004). *Manual for decoding secure base narratives*: Unpublished Manuscript, State University of New York at Stony Brook.

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*(3), 185-197. doi: http://dx.doi.org/10.1080/14616730600856016

Weaver, I. C., Cervoni, N., Champagne, F. A., D'Alessio, A. C., Sharma, S., Seckl, J. R., . . . Meaney, M. J. (2004). Epigenetic programming by maternal behavior. *Nature Neuroscience, 7*(8), 847-854. doi: 10.1038/nn1276

Webster-Stratton, C., Reid, M., & Hammond, M. (2004). Treating Children With Early-Onset Conduct Problems: Intervention Outcomes for Parent, Child, and Teacher Training. *Journal of Clinical Child and Adolescent Psychology, 33*(1), 105-124. doi: http://dx.doi.org/10.1207/S15374424JCCP3301_11

Webster-Stratton, C., Rinaldi, J., & Reid, J. M. (2011). Long-term outcomes of Incredible Years parenting program: Predictors of adolescent adjustment. *Child and Adolescent Mental Health, 16*(1), 38-46. doi: http://dx.doi.org/10.1111/j.1475-3588.2010.00576.x

Weinfield, N. S., Sroufe, L. A., & Egeland, B. (2000). Attachment from infancy to early adulthood in a high-risk sample: Continuity, discontinuity, and their correlates. *Child Development, 71*(3), 695-702. doi: http://dx.doi.org/10.1111/1467-8624.00178

Weinfield, N. S., Sroufe, L. A., Egeland, B., & Carlson, E. (2008). Individual differences in infant-caregiver attachment: Conceptual and empirical aspects of security *Handbook of attachment: Theory, research, and clinical applications* (2nd ed., pp. 78-101). New York, NY: Guilford Press; US.

Weinfield, N. S., Whaley, G. J., & Egeland, B. (2004). Continuity, discontinuity, and coherence in attachment from infancy to late adolescence: Sequelae of organization and disorganization. *Attachment & Human Development, 6*(1), 73-97. doi: http://dx.doi.org/10.1080/14616730310001659566

Weinraub, M., Brooks, J., & Lewis, M. (1977). The social network: A reconsideration of the concept of attachment. *Human Development, 20*(1), 31-47. doi: http://dx.doi.org/10.1159/000271546

Whipple, N., Bernier, A., & Mageau, G. A. (2011). A dimensional approach to maternal attachment state of mind: Relations to maternal sensitivity and maternal autonomy support. *Developmental Psychology, 47*(2), 396-403. doi: http://dx.doi.org/10.1037/a0021310

Wilson, P., Rush, R., Hussey, S., Puckering, C., Sim, F., Allely, C. S., . . . Gillberg, C. (2012). How evidence-based is an 'evidence-based parenting program'? A PRISMA systematic review and meta-analysis of Triple P. *BMC Med, 10*, 130. doi: 10.1186/1741-7015-10-130

Yang, T. T., Simmons, A. N., Matthews, S. C., Tapert, S. F., Frank, G. K., Max, J. E., . . . Paulus, M. P. (2010). Adolescents with major depression demonstrate

increased amygdala activation. *Journal of the American Academy of Child & Adolescent Psychiatry, 49*(1), 42-51. doi: http://dx.doi.org/10.1097/00004583-201001000-00008

Zegers, M. A., Schuengel, C., van IJzendoorn, M. H., & Janssens, J. M. (2006). Attachment representations of institutionalized adolescents and their professional caregivers: Predicting the development of therapeutic relationships. *American Journal of Orthopsychiatry, 76*(3), 325-334. doi: http://dx.doi.org/10.1037/0002-9432.76.3.325

Zegers, M. A., Schuengel, C., van IJzendoorn, M. H., & Janssens, J. M. (2008). Attachment and problem behavior of adolescents during residential treatment. *Attachment & Human Development, 10*(1), 91-103. doi: http://dx.doi.org/10.1080/14616730701868621

Zelenko, M., Kraemer, H., Huffman, L., Gschwendt, M., Pageler, N., & Steiner, H. (2005). Heart Rate Correlates of Attachment Status in Young Mothers and Their Infants. *Journal of the American Academy of Child & Adolescent Psychiatry, 44*(5), 470-476. doi: http://dx.doi.org/10.1097/01.chi.0000157325.10232.b1

Zimmermann, P., Fremmer-Bombik, E., Spangler, G., & Grossmann, K. E. (1997). Attachment in adolescence: A longitudinal perspective. In W. Koops, J. B. Hoeksma & D. C. van den Boom (Eds.), *Development of interaction and attachment: Traditional and non-traditional approaches* (pp. 281–292). North-Holland, Amsterdam: Koninklijke Nederlandse Akademie van Wetenschappen Verhandelingen, Afd.