A MODIFICATION OF THE AMBIANCE SCALE FOR USE WITH FOUR-MONTH-OLD INFANTS AND THEIR CAREGIVERS: DEVELOPMENT, STABILITY, AND PREDICTIVE VALIDITY

by

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A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy,
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ABSTRACT

A Modification of the AMBIANCE for Use with 4-Month-Old Infants and their Caregivers: Development, Stability, Predictive Validity

by

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The disorganized infant attachment classification, much more than avoidant and ambivalent, has become widely regarded as a marker of risk for maladaptive or psychopathological development predicting the presentation of behavior problems in childhood and adolescence (Lyons-Ruth & Jacobvitz, 1999). The Atypical Maternal Behavior Instrument for Assessment and Classification (AMBIANCE) (Bronfman et al., 1999) represents an attempt to operationalize caregiving behaviors associated with disorganized infant attachment. Previous studies using the AMBIANCE scales have linked high levels of atypical caregiving behavior during Ainsworth's Strange Situation to high rates of disorganized infant attachment. The AMBIANCE scale was developed to assess interactions between caregivers and their 12 to 24-month-old infants in the Strange Situation, and no closely comparable, validated tool exists for assessing atypical parenting behaviors in relation to younger infants (i.e., 6-month-old and younger). This limitation is notable given that levels of disrupted parent-infant communication associated with disorganized infant attachment have been observed as early as the first few weeks of infancy.

The present study modified the AMBIANCE in order to assess caregiver interactions with very young infants (i.e., infants < 6-months). Participants were 51 mother-infant pairs who were assessed longitudinally when infants were 4-months and 14-months of age. At age 4-months, infants and mothers were videotaped using a split-screen while engaged in a five minute face-to-face interaction, and these videotaped interactions were coded using a modified version of the AMBIANCE scale. At age 14-months, infants and mothers were videotaped while participating in Ainsworth's Strange Situation, and these videotaped interactions were assessed using the original version of the AMBIANCE scale.

Correlational and chi-square analyses revealed that the level of atypical caregiving behaviors between 4-months and 14-months was significantly stable, providing evidence suggesting the value of assessing affective communication between infants and caregivers at younger ages. Chi-square analysis revealed a significant association between organized/disorganized attachment status and disrupted/not disrupted affective communication status during mother-infant interactions at 4-months. The findings suggest that the presence of high levels of disrupted affective communication at 4-months was highly related to disorganized attachment at 14-months. This research has implications for the earlier identification and intervention with at-risk parent-infant dyads.

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Introduction

> ...Human beings of all ages are found to be at their happiest and to be able to deploy their talents to best advantage when they are confident that, standing behind them, there is one or more trusted persons who will come to their aid should difficulties arise. (Bowlby, 1973, p. 359).

For decades, developmental and clinical psychologists have viewed early childhood relationships as having enduring consequences for psychological growth and well-being. This belief was crystallized early on by Freud (1940/1963) who described the mother-infant relationship as "unique, without parallel, established unalterably for a whole lifetime as the first and strongest love-object and as the prototype for all later love relations" (p. 188). Drawing on this legacy, John Bowlby developed a theory of attachment, which proposes that differences in the quality of caregiver-infant attachments have important implications for shaping later intimate relationships, personality organization, and even for the development of psychopathology.

Owing to the pioneering efforts of Mary Ainsworth, whose empirical research both operationalized and buttressed Bowlby's theories, there is considerable agreement that sensitive, responsive caregiving is a central component of promoting infant attachment security. According to Winnicott (1971), infants who consistently experience sensitive caregiving develop "confident expectations" that important others will be emotionally available and responsive. An accumulation of these experiences during the first year of life facilitates infants' developing internal working models of attachment figures as available and responsive when needed and corresponding models of self as

valued and love-worthy. Conversely, when the experience of insensitive, inconsistent, and misattuned care is the norm, infants are predisposed to developing internal working models of attachment figures as unresponsive and rejecting and corresponding models of self as devalued and lacking efficacy.

Central to the concept of attachment is that the *organization* of attachment models, whether secure or insecure, reflect different environmentally adaptive strategies for interacting with attachment figures. The relatively recent concept of *"disorganized"* attachment emerged from the systematic study of more than 200 parent-infant dyads that were difficult to classify in one of the three organized attachment categories (Main & Solomon, 1986). Unlike infants with organized states of mind, classified as secure, avoidant, or anxious-resistant, infants classified as "disorganized/disoriented" lack coherent, adaptive strategies for dealing with the stress of brief separations from their caregivers.

Compared to infants using organized attachment strategies, disorganized infants appear to have difficulty maintaining strategic adjustments in attachment behaviors, resulting in a breakdown in both behavioral and physiological regulation. Behaviors indicating disorganized attachment are often appear fleeting and out of context, such as when a toddler, who seems to be in a good mood, suddenly strikes his or her caregiver; or when a child who has been crying due the caregivers' absence responds by backing away from, rather than approaching the caregiver, upon her return. The disorganized attachment classification, much more than avoidant and ambivalent, has become widely regarded as a marker of risk for maladaptive or psychopathological development (Barnett, Ganaban, & Cicchetti, 1999; Main, 1996), predicting the presentation of

behavior problems in childhood and adolescence (e.g., Carlson, 1998; Lyons-Ruth, Alpern, & Repacholi, 1993; vanIJzendoorn, Schuengel, & Bakersman-Kranenburg, 1999).

There has been considerable debate in the attachment literature concerning the developmental precursors of disorganized attachment. Current views hold that nonstrategic, disorganized attachment behaviors are highly related to environmental factors, such as maltreatment and unpredictable and/or fear evoking interactions with caregivers; however, disorganized/disoriented attachment is also consistently present, albeit at lower levels, in low-risk samples of psychologically well-functioning caregivers. Lyons-Ruth and colleagues have suggested that disruptions in parent-infant affective communication may play a central role in the etiology of infant disorganization. They hypothesize that caregivers of disorganized infants may be distinguished from those whose children's attachment behaviors are organized by their failure to correct or repair communication errors as much as by the quality of the "errors" themselves. Specifically, Lyons-Ruth and colleagues note that, "repeated lack of appropriate responsiveness to the intention conveyed in the infant's communications could take many forms, including antagonism, withdrawal, intrusive overriding of the infant's cues, or role-reversing focus on the parent's needs rather than the infant's needs" (Lyons-Ruth, Bronfman, & Atwood, 1999, p. 52).

The Atypical Maternal Behavior Instrument for Assessment and Classification (AMBIANCE) (Bronfman et al., 1999) represents an attempt to operationalize behavioral manifestations of caregivers' failures to interpret and respond to the affective communications of their infants. Using the AMBIANCE scale to code mother-infant

behaviors in a sample of high-risk mother-infant pairs, Lyons-Ruth et al. (1999) found that high levels of disrupted communication in caregivers as observed in the Strange Situation were positively correlated with infant attachment disorganization.

For the purposes of this study, it is important to note that the AMBIANCE scale was developed to assess interactions between caregivers and their 12 to 24-month-old infants, ages when patterns of infant attachment have already formed and have become relatively stable. At this study's inception, there was no closely comparable, validated tool for assessing atypical parenting behaviors in relation to younger infants (i.e., 6-month-old infants and younger). This limitation is notable given that levels of disrupted parent-infant communication associated with the development of disorganized infant attachment have been observed as early as the first few weeks of infancy. Thus, one of the central aims of this research included modifying the AMBIANCE scale in order to assess levels of atypical maternal behaviors at 4-months, an age when attachment patterns have not yet consolidated. Thus, this research may have implications for the earlier identification of at-risk parent-infant dyads, providing an opportunity to offer families assistance before the detrimental effects associated with disorganized attachment take root.

The goals of the present investigation were twofold: First, it set out to modify Bronfman et al.'s (1999) AMBIANCE scale in order to assess the quality of affective communication between caregivers and very young infants (i.e., < 6 months old). The second goal of the study entailed testing the modified version of the scale by investigating the stability and predictive validity of atypical maternal behaviors at ages 4 and 14 months and their relation to disorganized attachment. Specifically, the study

examined whether the modified version of AMBIANCE could be used to identify parent-infant behaviors at 4 months in order to predict disorganized patterns of infant attachment at 14 months. It was hypothesized that the presence of higher levels of atypical caregiving behaviors at 4 months would predict higher levels of atypical caregiving behavior at 14 months. Furthermore, it was hypothesized that the cumulative effect of such disruptions in affective communication would increase the likelihood of infants' developing disorganized/disoriented strategies for eliciting care from their mothers during times of stress.

CHAPTER II

Literature Review

The present study involved two major components. First, it set out to modify Bronfman et al.'s (1999) AMBIANCE scale in order to assess the quality of affective communication between caregivers and very young infants (i.e., < 6 months old). The second goal of the study entailed testing the modified version of the scale by investigating the stability and predictive validity of atypical maternal behaviors at ages 4 and 14 months and their relation to disorganized attachment.

Accordingly, the review of the literature, divided into four sections, addresses issues that are salient to understanding various aspects of parent-infant interactions. It begins with a review of theoretical underpinnings of early parent-child relationships, the central role of early caregiving, and some of the implications for later development. The second section explores literature, both empirical and theoretical, addressing specific components of parent-infant interactions. This review focuses on parent-infant communication and its role in early development, including interactive processes related to infants' developing capacities for affective-cognitive organization and the implications for parent-infant relationships. Atypical parenting behaviors and their role in developmental outcomes in infancy are also discussed.

Next, given that the assessment of infant attachment security is a widely accepted empirical approach for studying developmental outcomes associated with different styles of parent-infant interaction, the third sections focuses on the literature that has emerged from the field of attachment. It begins with the early work of Bowlby and Ainsworth,

and continues through to the discovery of disorganized attachment and recent attempts to understand its developmental antecedents. The fourth and final section reviews the theoretical foundations of the Atypical Maternal Behavior Instrument for Assessment and Classification (AMBIANCE). The review also highlights the tool's usefulness in empirical investigations examining the relation between disrupted affective communication and the development of disorganized attachment during infancy.

I. Parent-Infant Relationships

That an infant's well-being cannot be considered apart from socio-emotional factors of the caregiving environment in which he or she grows, has come to be regarded as self-evident; however, this was not always the case. Prior to the 1950's, it was routinely recommended that infants awaiting adoption remain institutionalized for prolonged periods of time to allow the infant's personality to develop, thereby facilitating an appropriate match between the infant and adoptive parents (Emde, 1992). During the approved waiting period, infants received sufficient food, clothing, and shelter, but suffered from an acute lack of emotional nurture. Spitz (1946a) identified a syndrome associated with prolonged maternal deprivation, which he termed "anaclitic depression." In the study of one foundling home, they observed an alarming number of these infants experienced devastating problems in physical and socioemotional development, with 34 out of 91 infants dying over a period of two years (Spitz, 1946b), despite receiving hygienic care.

Prior to Spitz's empirical observations, high levels of infant mortality/morbidity had been typically blamed on the infants' having inherited weak constitutions from so-

called morally inferior mothers that conceived out of wedlock (Emde, 1992). Spitz's work provided one of the first alternative explanations, and as a result of Bowlby's (1951) report disseminating Spitz's findings and contributing additional evidence, adoption procedures were changed around the world. Moreover, Spitz's work provided crucial early evidence that socioemotional factors in the environment greatly influenced the course of infant development.

Additional early influences on theories concerning parent-infant relationships derive from studies of infant monkeys. Harlow's (1958) ground-breaking studies involved depriving infant monkeys of contact with their mothers and then offering two inanimate "mothers" as substitutes – a wire mesh "mother" suspending a milk bottle and a soft, cloth-covered "mother" that offered no food. Prior to Harlow's study, the popular evolutionary view promulgated that the development of parent-infant attachment was primarily motivated by supplying/obtaining food necessary for survival. The unexpected finding was that the infant monkeys developed a stronger relationship with the soft, nonfood providing "mother," rather than the "lactating" but tactilely uncomfortable one, as evidenced by duration of physical contact and in the use of her as a resource in times of stress.

These studies paved the way for further investigations concerning how parent-child relationships foster biological, social, and emotional aspects of development. Winnicott was a pioneer in the study of the importance of the mother's role in healthy child development. His concept of the "good-enough" mother, who creates a containing environment, has been influential in the way psychologists, mental health clinicians and the public view the role of mothering. Winnicott warned that if a mother failed to

provide a facilitating environment, her child would be at risk for developing a false sense of self, responding only to the "environmental impingements" imposed on him or her (Winnicott, 1965).

More modern psychoanalytic theorists, such as Ainsworth (1978), Kohut (1977), and Mitchell (1988), embraced the notion of the self being based in relationships. Winnicott's famous statement, "there is no such thing as an infant," was meant to capture the embeddedness of the infant in relational contexts. For example, Sandler (1987, 1993) proposed that early parent-infant interactions serve as the basis for the earliest conceptions of self and object representations and suggested all relationships are guided by the need to explore "role-responsiveness" based on these representations. Emde (1988) also views representations of self and other as arising from reciprocal exchanges with the mother, exchanges that simultaneously form the basis of a sense of "we." Similarly, Mahler, Pine, and Bergman (1975) describe a "symbiotic phase," a period of infant-caregiver dependency which serves as a necessary precursor for separation and individuation. Finally, according to Alan Sroufe, it is only by responding to infants' signals during the early weeks and months of life that caregivers imbue them with meaning and facilitate their becoming a part of an organized behavioral system (Sroufe, 1989).

Many theorists (e.g., Bion, 1977; Kohut, 1977; Winnicott, 1971) have postulated that one's sense of self is intimately tied to early mirroring experiences with significant others. Psychoanalytic thinkers maintain that infants' constructions of self-image are guided by how they see themselves as reflected through their parents' eyes. This belief is underscored by Eigen who states, "Good maternal mirroring helps form the basis of

adequate self-esteem and the hopeful sense of possibilities." (p. 38). Eigen's statement emphasizes the idea that, much more than merely buffering infants from the harshness of the environment (i.e., providing vital physical care and protection), patterns of parenting behavior, both sensitive and insensitive, have significant effects on infants' developing self-representations and related outcomes.

II. Parent-Infant Affective Communication

A. Infants as Social Partners

Not that long ago, a widely accepted view of human infants assumed they were passive, undifferentiated organisms shielded by a stimulus barrier (e.g., Mahler et al. 1975) and in a state of fusion with their environment (Wallon, 1970). More recent empirical findings, however, provide evidence that as early as at birth, infants demonstrate an innate sensitivity to social stimuli (Rochat & Striano, 1999). For example, despite poor visual acuity, newborns track face-like drawings significantly more readily than nonface-like drawings (Johnson, Dziurawiec, Ellis & Morton, 1991). Newborns also respond differentially to external and self-administered tactile stimulation, suggesting a rudimentary ability to distinguish between self and environment (Rochat & Hespos, 1997).

Currently, it is generally accepted that infants, from the early days and weeks of life, are equipped with learning capacities and specific preparedness for mentally representing their surrounding physical and social world (Emde, 1988; Gergely, 1992; Rochat, 1999; Stern, 1985). The current dominant view of early development maintains that caregivers and infants form an affective communication system from the beginning

of life. This change is reflected by recent research related to early emotional development, which assumes a substantial degree of biosocial preadaptation for emotional communication in infancy (Stern, 1985). Research has demonstrated that 2-month-old infants readily make fundamental distinctions between people and objects (Brazelton, 1974; Trevarthen, 1979). Young infants can also distinguish among different facial expressions of others (Malatesta & Izard, 1984). For example, infants look more frequently and longer at facial expressions of joy than anger. Ten-week-old infants react to maternal facial and vocal displays of anger with anger but have fewer angry responses to maternal displays of sadness (Haviland & Lelwica, 1987).

Moreover, research has demonstrated that even young infants' reactions are influenced by contextual factors. For example, a mother wearing a mask elicits laughter while a stranger wearing the same mask typically elicits distress and fear (Sroufe, 1979). Similarly, when a stranger enters a room, most infants will immediately engage in social referencing; that is, look towards their caregiver in order to gauge whether the stranger's presence represents any form of threat (Klinnert, Emde, et al., 1986). Joseph Campos and colleagues made a classic observation of how 10-month-old infants presented with a "visual cliff" appreciate the affective expressions of other and modify their actions on the basis of that appreciation (Campos et al., 1983). Thus, not only do infants actively seek out affective information from trusted others to supplement their understanding, but they use it to *override* their own appreciation and perception of events.

Recently there has been a renewed interest in examining the underlying mechanisms that influence infants' capacities to be effective social partners (Bigelow, 1999; Gergely & Watson, 1999; Rochat & Striano, 1999). One such mechanism that has

been gaining increased attention is that of contingency detection, that is, infants' innate capacities for being highly sensitive to the existence of contingencies between their behavior and environmental events. According to Gergely and Watson (1999):

> The capacity to accurately interpret stimulation as contingent or not could well be viewed as the most fundamental of an infant's innate modules for interpreting early stimulation. Whether as a means to establish a basis of conditioning (e.g., Bandura, Skinner) or a basis for building representations of social relations (e.g., Bowlby, Bruner, Trevarthen), an infant's capacity to detect contingency is taken for granted, (p. 101).

Similar to Piaget's (1952) concept of primary circular reactions, contingency detection is hypothesized as being the primary ways infants learn self-detection or self-awareness (e.g., watching one's fingers as one moves them), which Watson (1995) suggests is necessary preparation for infants' developing capacities to cope with the environment. Watson (1994) further hypothesized that at approximately 3 months of age, maturational factors cause the infant's contingency-detection mechanism to "switch" from a preference for perfect contingency to a preference for "high but imperfect degrees of (social) contingencies typically provided by the reactions of attachment figures attuned to the infant's affective communicative displays" (Fonagy et al., 2002, p. 167). This hypothetical "switch" is not only facilitates fundamental developmental functions, such as self-other differentiation and orientation toward the social environment; but also the development of emotional self-awareness and control, providing the foundation infants need in order to be effective social partners. (Gergely & Watson, 1999).

A growing body of empirical evidence investigating infants' response to contingent temporal events has supported its importance in facilitating infant's experience of self-coherence (Bigelow & Birch, 1999; Lestergee & Varghese, 2001; Nadel et al., 1999). Bigelow et al. (1996) investigated infants at ages 4, 6, and 8 months,

studying their responses to live and replayed videotaped interactions with their mothers and with their own images. At all ages, the infants showed more attention and smiling to the socially contingent behavior of their mothers than to the perfectly matched behavior of their self-images. Changes from imperfect contingency (live video) to noncontingency (replayed video) in the interactions with mothers resulted in reduced smiling and an immediate drop in attention, which cannot be attributed to prolonged interactions with the same image. An array of similar experiments, researchers have demonstrated that young infants have the capacity to recognize synchrony and respond to temporal congruities (Jaffe, Beebe et al., 2001; Lyons-Ruth, 1977; Patterson & Werker, 1999; Soken & Pick, 1999). Moreover, Stern (1977) emphasized that maternal synchronous behaviors tend to be highlighted and/or exaggerated during interactions with infants, suggesting that mothers exert effort in a manner often occurring outside their conscious awareness, to make the temporal structure of their behavior more readily detectable to infants. There is some consensus that an appreciation of temporal relations between events serves as a fundamental function in organizing the infant's experience of self and others, helping the infant to separate the world into self-caused and other-caused effects (Jaffe, Beebe et al., 2001; Stern, 1985; Watson, 1979).

B. Parents as Affect Regulating Partners

Gross (1998) defines affect regulation as "processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions" (p. 275). The ability to manage emotions in a flexible and adaptable manner is considered one of the essential developmental tasks of early development, and

parents are known to play crucial roles in helping infants learn how to self-soothe and maintain relatively stable levels of emotional and physiological arousal (Braungart-Rieker, Garwood, Powers, & Wang, 2001; Feldman, Greenbaum, & Yirmiya, 1999; Field, 1994; Lestergee & Varghese, 2001; Tronick, 1989). Sroufe (1996), for example, described emotion regulation in the early years as a process of moving from dyadic co-regulation between infant and caregiver during the first year, to the gradual emergence of autonomous self-regulation with caregiver-guided assistance, to the eventual internalization of emotional control in the preschool years. Models of psychobiological regulation (Hofer, 1994; Schore, 1994), emotion regulation (Tronick, 1989), self-regulation (Kopp, 1982), dynamic systems co-regulation (Fogel, 1993), and socialization (Maccoby, 1992) all suggest that self-regulation develops in the context of mutual regulatory parent-infant systems and that the coordination of affective expression during face-to-face interactions facilitates the transition from mutual regulation to self-regulation (Feldman et al., 1999; Tronick, Ricks, & Cohn, 1982).

Over the past two decades, several researchers have described the major features that characterize the mother-infant mutual regulatory system. One concept, widely regarded as a core feature mother-infant mutual regulation, is affect attunement. Stern (1985) describes affect attunement as nonverbal communication in which a mental state within one person becomes knowable to another. Stern (1984) states, "the mental state must first become manifest as overt behavior – and that overt behavior must be translatable – so the partner can sense the inner state lying behind another's overt behavior" (p.3). Most forms of affect attunement occur across sensory modes, utilizing combinations of visual, auditory, and tactile cues to communicate mental states. These

modalities are, in turn, integrated with yet additional features such as timing, rhythm, intensity, duration, contour, and closeness of affect match. Typical mother-infant engagements that provide opportunities for affect attunement often appear as the following: (1) the infant makes some affective expression; (2) the caregiver's response overlaps with the infant's expression or follows soon afterwards (< 2 seconds); (3) the infant attends to the caregiver's response, and so on. Aiming their efforts at understanding the complex features that comprise affect attunement, infant researchers have identified and studied key constructs such as, facial mirroring (Field, 1994, 2002; Field et al., 1998; Gergely & Watson, 1996), vocal rhythm matching (Deckner, Adamson, & Bakerman, 2003; Jaffe, Beebe et al. 2001), joint attention (Carpenter, Nagell, & Tomasello, 1998; Claussen et al., 2002), coordination of gaze (Kogan & Carter, 1996; Stifton & Moyer, 1991), synchrony (Feldman & Greenbaum, 1997; Feldman, Greenbaum, & Yirmiya, 1999; Isabella & Belsky, 1991, and contingency (Bigelow, 1999; Gergely & Watson, 1996, 1999).

A number of infant researchers have proposed that facial and vocal mirroring of affective behavior serve as the core components of parent-infant mutual regulation during the first year of life (e.g., Field, 1994, Jaffe, Beebe et al., 2001; Tronick, 1989). These face-to-face interactions, emerging at approximately 2 months of age and peaking at about 3 to 6 months, are highly arousing, affect-laden, short interpersonal events that expose infants to high levels of cognitive and social information. To enter into this affective communication, the caregiver must be attuned to the infant's overt behavior by understanding them as reflections of the infant's internal state (Fonagy et al., 2002; Schore, 1994). Mutual gaze interactions often unfold in predictable sequence of events.

For example, a mother will initially attune to and resonates with the infant's resting state; however, as the infant moves into either heightened and/or dampened states of arousal, she contingently fine tunes and corrects the intensity and duration of her affective stimulation to in order to help the infant maintain a positive affect state (Beebe & Lachmann, 1988; Gergely, 1999; Schore, 1997). As a result of moment-by-moment matching of affective direction, both partners increase together their degree of engagement and facially expressed positive affect. According to Beebe and Lachmann (1988), the more the mother tunes her activity level to the infant during periods of social engagement, and the more she allows him/her to recover quietly in periods of disengagement, the more synchronized their subsequent interactions.

Facial mirroring during face-to-face interactions with infants typically occurs simultaneously with vocalization, often in the form of vocal mirroring or vocal rhythm matching. In general, mothers and infants match their level of vocal activation, that is, the relative amount of time they are vocally "on" and vocally "off," and vocal mirroring and rhythm matching provide an essential means through which parent-infant pairs convey understanding and appreciating each other's affective state (Jaffe, Beebe et al., 2001). Caregivers routinely use their voices to reflect back to the infant, the infant's state of contentment, joy, fear, anger, surprise, frustration, and fatigue. Vocal interaction with infants, for example, plays a key role in facilitating an infant's management of distress. A caregiver's partial "matching" or "joining" the infant's expressions of distress with corresponding vocal empathy, but without the full volume or intensity, is often highly effective in helping the infant to regulate his or her level of affective arousal (Stern, 1985). Furthermore, in matching the infant's rhythm of fussing or crying the

infant presumably experiences the caregiver as "with" him or her, which then gives the caregiver the ability the further influence the infant by slowly regulating the tempo and volume downward (Beebe, Lachmann, & Jaffe, 1997).

Gaze regulation, that is, looking and looking away, provides an additional fundamental mechanism that allows infants to control their level of physiological stimulation. Stern (1984, 1985) showed that mothers gaze at their infant during the majority of time spent in face to face interactions, and it is primarily the infant who "makes or breaks" the visual contact. Brazelton, Kozlowski, and Main (1974) showed that most mothers facilitate their infant's capacity to self-regulate by reducing their level of stimulation when infants look away, and increasing their level of stimulation when the infant looks back. Field (1982) showed that infant gaze aversion functions to reduce level of arousal. The physiological stimulation of face-to-face interactions can be measured by the infant's heart rate, which rises in response to gazing at his or her caregiver. As soon as the baby looks away, however, the heart rate decreases back to baseline levels. Field (1982) also showed that teaching caregivers to pause during infant gaze aversion supported more effective mother-infant interactions. Gable and Isabella (1992) found that maternal responsiveness with 4-week-old infants accounted for a significant amount of the variance in the infant's ability to regulate levels of arousal at age 4-months.

In addition to communicating affect in a manner that facilitates the infant's affect regulating capacity, both facial and vocal mirroring help the infant form expectancies in relation to their environment. According to numerous researchers (Gergely & Watson, 1999; Jaffe, Beebe et al., 2001; Claussen et al., 2001) expectancies related to social

interaction sequences serve as a critical organizing feature of the mother-infant communication system. Haith and colleagues (1988) observed that infants appear to be intrinsically motivated to order information, detect regularity, generate expectancies and then act on them. Both the infant and caregiver conjointly generate patterns of expectation, constructed through the sequence of one's actions in relation to those of the other's (patterns of coordination), and an associated self-regulatory range and style learned therein (Jaffe, Beebe et al., 2001). This type of teaching-learning plays a critical role in helping the young infant's ability to evaluate their sense efficacy within their environment, thereby facilitating the organization and coherence of their self-experience.

C. Disruptions in Parent-Infant Affective Communication

It is important to emphasize that most behavioral adjustments during face-to-face interactions with infants occur outside the conscious awareness of most sensitive caregivers. Similarly, when parent-infant interactions lack adequate levels of affective attunement, synchronization, contingency, and/or matching, these too, typically occur outside caregivers' conscious awareness. It has been hypothesized that the manifestation of disturbed parent-infant interactions can be often understood as a result of the parent's caregiving behaviors being dominated by negative mental representations of self and/or distorted representations of the infant (Lieberman, 1997; Slade, 1999). For example, a mother, who has fears and doubts concerning herself or her caregiving skills, may be placed at higher risk for misinterpreting her infant's gazing away behavior as a rejection of her ministrations rather than the infant's active attempt to regulate himself or herself. This negative self-representation may, in turn, result in the mother's being either more

intrusive or more passive in her ongoing interactions with her infant than she would be if she were more realistic in her self-appraisals. Moreover, it is not difficult to imagine that as this type of disturbed interaction becomes prototypical for the dyad, the infant's negative response to his or her caregiver's interactive style will further support the mother's negative self-representations and/or her negative attributions towards her infant (e.g., "...s/he is spoiled," "doesn't like me," or "has no appreciation for how hard I try," etc...), resulting in a negative cyclical psychodynamic (Wachtel, 1997).

Interaction disturbances are frequently characterized by the caregiver's overstimulation, misattunement, and a lack of repair of interactive errors (Brazelton et al., 1974; Tronick, 1989). Infants often respond to these kind of interactive disturbances by gazing away from the caregiver for relatively prolonged periods of time (Murray & Trevarthen, 1985; Tronick, 1989). In contrast to more readily sensitive caregivers, who typically reserve stimulation for infants' attentive periods, and reduce or terminate activities as infants turn away in order to self-regulate; less sensitive caregivers often respond to infant's turning away with increased stimulation (Murray, 1997). This kind of response has been described by Beebe (1998) as "mutually escalating over-arousal," in which each partner responds to the other's distress with a reciprocal escalation of distress.

Numerous research studies have demonstrated that disruptions in parent-infant interactions in non-maltreated samples are associated with less optimal developmental infant outcomes (Claussen et al., 2002; Isabella & Belsky, 1991; Kogan & Carter, 1996). In a study of 153 mothers and their 1st-borns (aged 3 months at initial observation), Isabella and Belsky (1991) tested whether interactions of mother-child dyads developing secure attachment relationships would be characterized by synchronous exchanges and

those of dyads developing insecure relationships by asynchronous exchanges. They found that dyads developing secure attachments were observed at ages 3 and 9 months to interact in a well-timed, reciprocal, and mutually rewarding manner; while dyads developing insecure relationships were characterized by interactions in which mothers were minimally involved, unresponsive to infant signals, or intrusive. Within the insecure group, 3- and 9-mo interactions of avoidant dyads were characterized by maternal intrusiveness and overstimulation, and anxious-resistant dyads were characterized at both ages by poorly coordinated interactions in which mothers were underinvolved and inconsistent.

Studying 4-month-old during a procedure where mothers were instructed to maintain neutral, nonresponsive facial expressions with their infants, Kogan and Carter (1996) demonstrated that mothers who were more sensitive in face-to-face interactions reengaged following the still-face, using a more well-*regulated*, interpersonally oriented style; whereas infants of mothers who were less sensitive exhibited high amounts of avoidant and/or resistant behaviors in reengagement. In addition, they found that mothers demonstrating more sensitive styles of interacting were significantly more likely to have infants who were classified as securely attached at age 12 months as assessed by the Strange Situation.

Research related to post-partum depression has provided particularly useful information concerning the effects of maternal inadequate responsiveness on infant outcomes. Cohn and Tronick (1989), for example, showed that among depressed mothers, intrusive behavior by the mother was associated with infant gaze aversion, while withdrawal by the mother was associated with infant protest. In studies examining post-

natally depressed mothers without other risk factors, both Field (Field, Healy, Goldstein & Guthertz, 1990) and Cohn (Cohn, Campbell, Matias, & Hopkins, 1990) found that nondepressed mothers and infants tend to match affect in the positive range, while depressed mothers and infants demonstrate strong tendencies to mach affect in the negative range. Moreover, Field and colleagues (1990) found that depressed mothers often averted their gaze from the infant *first*, followed by the infant's breaking off his or her gaze in response to the mother's behavior. This is significant because infants are most likely to engage with positive affect *after* their mothers become positive, with mothers remaining positive until their infants sober and gaze away. These studies suggest maternal depression has the negative effects on mother-infant relationships that one would expect in response to behaviors typically associated with clinical depression. Flat affect, irritability, and/or withdrawal characterize the interactions of most mothers described in these studies with their infants demonstrating limited engagement with the environment, clearly suggesting the negative impact of maternal depression on infant behavior.

In sum, the reviewed findings emphasize that infants possess an innate preparedness for emotional expression, and they are sensitive to the contingency structure provided by face-to-face affective communication. Moreover infants are to a great extent dependent on the affective-regulative interactions of caregivers in order to develop the capacity to moderate their own levels of affective arousal. Infant research suggests strongly that the first few months of life are considered a critical time for the early development of such communication skills, skills that will also provide the foundation for the infant's affective experience and associated internal working models of important

others (Jasnow & Feldstein, 1986; Stern, 1985). The findings above also indicate that an infant's capacity to regulate and respond to affect states in an organized manner may be strongly influenced by the characteristics of the caregiver's affective communication behaviors. Finally, a great deal of empirical evidence supports that effective parent-infant communication is associated with more positive developmental outcomes.

III. Parent-Infant Attachment

A. Theoretical Foundations

Bowlby (1969, 1988) defined attachment as the enduring affectional tie that develops between infants and their caregivers during the first year of life. He believed that attachment needs were universal, lifelong characteristics of all human beings regardless of culture. Using an ethological approach, Bowlby regarded attachment behaviors, such as seeking proximity to one's caregiver in response to environmental threats, as biological imperatives that dramatically improved chances for survival. Nonetheless, Bowlby thought it unnecessary to view attachment as secondary to more fundamental processes or drives in that children are thought to become attached regardless of whether their parents meet their physiological needs. Evidence that infants become attached even to abusive parents (Bowlby, 1956), powerfully suggests that the attachment system is not merely a product of secondary drives.

According to Ainsworth (1989), in order for affectional bonds to be considered as such, they must meet several requirements. First, an affectional bond is enduring, not transient; and it involves a specific person, who is not interchangeable with any other. This requirement reflects Bowlby's belief that the bond reflects "the attraction that one

individual has for another *individual*" (Bowlby, 1979, p. 67, his emphasis). He illustrates this point by emphasizing that the sadness associated with losing a loved one is not at all significantly remedied by the knowledge that one has other loved ones. Affectional bonds also require that the individual wishes to maintain contact with the person, and that involuntary separation from the person is experienced as distressing. Ainsworth emphasized that attachment bonds are a subtype of affectional bond, which requires an additional criterion in addition to the ones listed above: Attachment bonds require that the individual seeks security and comfort in the relationship with the attachment figure who is "older and wiser" (Bowlby, 1984). The attachment is considered "secure" if the relationship with the attachment figure provides comfort and security, and "insecure" if it does not.

Bowlby's theories informed the work of Mary Ainsworth, who was the first person to devise a method for measuring human attachment. Ainsworth and Wittig (1969) developed the Strange Situation, a standardized laboratory procedure, which can be used to measure infant attachment as early as 12 months and seeks to classify the infant's attachment security to his/her caregiver. Congruent with Bowlby's theory, the Strange Situation is designed to be incrementally stressful for the infant in order to elicit and intensify attachment behavior. The procedure consists of eight distinct episodes (each three minutes long), presented in a fixed order, which includes exposure to a stranger and two separations and reunions with an attachment figure. The Strange Situation is conducted in a laboratory playroom with toys to entertain the infant and a two-way mirror through which the experimenter can videotape behaviors unobtrusively.

Using Ainsworth's coding system, attachment classifications are assigned to infants based on the quality of interactions between the infant and caregiver.

B. Infant Attachment

In their pivotal longitudinal study involving 106 middle-class mother-infant dyads, studied both at home and in the laboratory, Ainsworth, Blehar, Waters, and Wall (1978) demonstrated that attachment behaviors cluster by type. They discovered that infants classified as insecure experience more difficulty communicating their needs to their caregivers and display more ambivalent or avoidant behaviors while distressed and seeking comfort. In terms of ecological validity, Ainsworth and colleagues also discovered a significant relation between caregiver-infant behaviors observed at home and infant attachment classification as measured by the Strange Situation. This finding was crucial given that a great deal of the Strange Situation's value and utility lies in its ability to describe and predict the actual quality of parent-child relationships.

Although relatively few studies have investigated the relation between maternal behavior and disorganized attachment, numerous studies have addressed this issue using Ainsworth et al.'s (1978) original classifications. Mothers of securely attached infants have been noted as being more sensitive to their infants' cues for proximity and contact (Ainsworth, 1978), more responsive in their early face-to-face interactions (Blehar, Lieberman, & Ainsworth, 1977), more affectionate and gentle (Londerville & Main, 1981), and more positive in their vocalizations (Roggman, Langlois, & Hubbs-Tait, 1987) than mothers of insecurely attached infants.

There are two attachment strategies regarded as insecure by Ainsworth and colleagues – the avoidant and ambivalent/resistant categories. Infants classified as insecure (both types) show more distress at home than secure infants and respond more negatively to both physical contact and its cessation (Ainsworth et al., 1978). Likewise, Pederson et al. (1990) found that mothers of insecure infants were generally less responsive and more resentful of their children than mothers of secure infants. In the Strange Situation, infants classified as avoidant ("A") tend to avoid proximity and/or eye contact during reunion episodes. Ainsworth et al. observed mothers of avoidant infants to interfere with infant activities, reject physical contact, and handle the infant more roughly. In contrast, anxious/resistant ("C") infants both strongly seek contact with their mothers, and yet actively resist contact when it is offered (Ainsworth et al., 1978). Infants who are classified as resistant also tend to demonstrate "angry" behaviors, with little tendency to ignore their mothers. Ainsworth et al. (1978) hypothesized that mothers of "C" infants are less responsive to infant signals and are inconsistent in their response to infants' needs for bodily contact. The infants, Ainsworth and colleagues believed, need to amplify their distress signals in order to attain a predictable response from their mothers.

While insecure patterns include behaviors that may seem contradictory to the goals of attachment, the behaviors are viewed as organized strategies in response to caregivers demonstrating less than optimal behavior. Isabella and Belsky (1991) and Main and Solomon (1986) suggest that the behaviors exhibited by these strategies actually promote attachment by eliciting a consistent quality of caregiving involvement thus providing structure, rendering the infant's attachment insecure, yet still organized.

C. Disorganized Attachment

Main and Solomon's (1986) landmark discovery of the "disorganized/ disoriented" attachment category was based on a recognition that some infants were difficult or impossible to classify in the strange situation using Ainsworth's three-category attachment classification system (Ainsworth et al., 1978). They concluded that what these infants had in common was contradictory and conflicting behavioral tendencies (e.g., turning in circles, approaching mother with head averted) suggesting attachment disorganization and signs of apprehension (putting their hands to their mouth; falling huddled to the floor upon their mother's entrance) or disorientation (postural stilling and dazed affect and/or mistimed and anomalous movements). Main and Hesse (1990) proposed that frightened caregiving behavior occurs spontaneously and is triggered internally, stemming from parents' thoughts or from events or objects in the environment associated with their own traumatic and/or frightening experiences. Moreover, Main and Hesse (1999) suggest the apparent inexplicability of such frightened caregiving behavior will inevitably be alarming to an infant.

Main and colleagues' descriptions of disorganized/disoriented behavioral patterns in infants have led to a surge of over 80 empirical and theoretical publications on the developmental origins, correlates, and outcomes of attachment disorganization (see van IJzendoorn, Schuengel, & Bakersman-Kranenburg, 1999). A meta-analysis conducted by van IJzendoorn et al. (1999) indicated that the percentage of infants classified as

disorganized was 14% in middle-class, nonclinical groups in North America (N=1,882) and 24% in samples with low socioeconomic status (N=493). Results of studies investigating the stability over time of disorganized attachment behaviors have been mixed. The stability of the disorganized pattern in a maltreatment study conducted by Barnett, Ganaban, and Cicchetti (1999) was 67% from 12 to 18 months and 81% from 18 to 24 months, compared to stabilities of secure attachment of 75% and 69%, respectively. In contrast, in a high-risk sample, Lyons-Ruth, Repacholi, McLeod, and Silva (1991) reported a much lower stability rate from 12 to 18 months, primarily due to a substantial increase in disorganized attachment between 12 and 18 months of age. Vondra et al. (1999) and Beckwith and Rodning (1991) also reported increases in disorganized attachment from 12 to 18 months in low-income samples.

Incidence of disorganized attachment classification has ranged from 13% to 82%, depending on the presence and types of family risk factors. The disorganized/disoriented pattern tends to be exhibited at significantly higher rates in samples in which there is parent psychopathology, child abuse, or very high social risk (Cicchetti & Barnett, 1991; Crittenden, 1988; Lyons-Ruth et al., 1987; O'Connor, Sigman, & Brill, 1987).

In order to explore the reasons that some infants did not fit in Ainsworth's original classification system, Main and Solomon (1986) conducted a nonblind review of Strange Situation videotapes previously deemed "Unclassifiable." They compiled a list of the unusual and contradictory infant behaviors they observed in the "Unclassifiable" tapes and proceeded to develop a comprehensive checklist. Main and Solomon discovered that the descriptions of unusual behaviors successfully differentiated the unclassifiable infants from the classifiable ones.

Next they encouraged researchers working in samples with many unclassifiable infants to recode their data using the disorganized attachment checklist. From this they discovered that their new disorganized behavior checklist not only provided a way of classifying infant behavior previously regarded as "Unclassifiable," but also successfully differentiated abused infants from nonabused infants who had previously been coded as secure (Carlson, Cicchetti, Barnett, & Braunwald, 1989; Spieker & Booth, 1988).

In general, Main and Solomon assert the importance of noting the context in which behavior occurs in order to determine whether it is should be regarded as disorganized. For example, dazed behavior is not that unusual for an organized infant during a separation episode, but is considered unusual for the same infant when it occurs during a reunion episode. Specific scoring criteria for the infant attachment disorganization identified by Main & Solomon (1990) include the following:

- *Sequential display of contradictory behavior patterns* such as a strong display of proximity seeking followed immediately by avoidance with no observable environmental change.
- *Simultaneous display of contradictory behavior patterns* such as seeking proximity by crawling backwards toward parent.
- *Undirected, incomplete, and interrupted movements and expressions* such as stopping suddenly after strong proximity seeking.
- *Stereotypies, assymetrical movements, mistimed movements, and anomalous postures* such as rocking, head banging, or holding head at a cocked angle.

- *Freezing, stilling, and slowed movements and expressions*, such as holding arms up waist high for an extended period of time with no observable purpose, or standing still for an extended period of time.
- *Direct indices of apprehension regarding the parent*, such as exhibiting sudden fear upon hearing the parent's voice.
- *Direct indices of disorganization or disorientation*, such as quickly putting hand to mouth upon reunion with parent rather than seeking proximity (Main and Solomon, 1990, pp. 135-146).

IV. The AMBIANCE Coding System: Measuring Disruptions in Mother-Infant Affective Communication

For more than a decade, Karlen Lyons-Ruth along with several colleagues have made a number of important contributions towards understanding problems that arise in the context of parent-infant relationships, including some developmental antecedents closely tied to disorganized infant attachment (Lyons-Ruth, 1996; Lyons-Ruth & Block, 1996; Lyons-Ruth, Connell, Zoll & Stahl, 1987; Lyons-Ruth, Repacholi, McLeod, & Silva, 1991). In studying various factors associated with high-risk, maltreated infants and their caregivers, Lyons-Ruth, Connell, and Zoll (1989) asserted that the bulk of research investigating the relation between parental behavior and attachment emphasizes the benefits of sensitive responsiveness without an equal emphasis on the identification and description of insensitivity. Accordingly, they have suggested that *organized* attachment strategies may not be strictly related to the active *presence* of parental sensitivity, but

rather to the relative *absence* of pervasively disturbed expressions of insensitivity, such as hostile intrusiveness or significant levels of withdrawal.

In their "relational-diathesis" model of disorganized attachment, Lyons-Ruth and colleagues (1999) link the terms "relational" and "diathesis," drawing attention to Bowlby's conviction that the impact of both potentially traumatic and normative threats or stressors is mediated, in part, by the availability of effective comfort and soothing from close attachment figures. Thus, when such threats to infants are *not* mostly met by effective soothing from caregivers, but rather by pervasive expressions of affective misattunement, infants are not only less buffered from such stresses, but rather the stress and its related effects may be deleteriously compounded

Expanding on Hesse and Main's (1990) hypothesis that disorganized attachment arises from experiencing the caregiver as frightened and/or frightening, Lyons-Ruth et al. (1999) proposed that infants chronically exposed to profound disruptions in affective communication are at significant risk for developing disorganized attachment. They suggested that extreme forms of misattunement are fear-arousing in themselves simply due to the fact that, unlike the mutually regulating interactions that generally describe secure, avoidant, and anxious-resistant infants; disorganized infants quite often have no dependable way of influencing attachment figures during times of distress. The relational-diathesis model of disorganized attachment also emphasizes the presence of a marked imbalance within the parent-infant relationship, where the needs of the caregiver very often override the needs of the infant, especially during times of stress. As a result, the infant's need for adequate levels of contingent responsive care routinely goes unmet,

leaving the infant with no reliable means for eliciting care, causing high levels of dysregulation/disorganization.

In positing their "competing strategies" hypothesis, Lyons-Ruth and colleagues suggested that a caregiver with unresolved loss or trauma in relation to attachment needs (Main & Hesse, 1990), is likely to exhibit contradictory attachment behaviors toward the infant, especially in the face of stressful circumstances with heightened attachment demands (e.g., during the Strange Situation). Examples of competing or contradictory behavior would include ones that simultaneously reject and heighten the infant's attachment needs, such as hushing and putting down a crying infant and directing him or her to play with a toy.

Research has demonstrated that the range of unbalanced relational patterns includes dominant-submissive ones in which the caregiver dominatingly opposes and undermines the initiatives of the infant (Hann, Castino, Jarosinski, & Britton, 1991; Jacobsen & Miller, 1998), as well as in more subtle, yet equally powerful forms of relational imbalance, in which caregivers passively withdraw and ignore the infant's distress. While lacking overt hostility, patterns yields similar results in that the caregiver's unresponsiveness successfully defeats the infant's attempts to jointly regulate the attachment relationship. Lyons-Ruth and colleagues (1999) emphasize, "The more skewed these relational roles become, that is, the more one partner's initiatives are ignored or overridden by the other, the more discontinuous and self-contradictory are the internalized models that accommodate both relational possibilities (e.g., I should accept external control and take no initiative/I should control the other by overriding the other person's initiative)" (p. 38).

Observing that the repeated failure to alter caregiving behaviors in the face of clear and repeated infant cues induced fear regardless of whether the unresponsive caregiving behavior was withdrawing, intrusive, role-reversing or rejecting led Lyons-Ruth et al, (1999) to propose their "failure to repair" hypothesis. This hypothesis states that parental behaviors that exceed the tolerance limits for supporting an organized infant attachment strategy should lead to infant disorganization. That is, in order for an infant's secure, ambivalent or avoidant attachment strategies to remain stable and not breakdown, the strategy must adequately elicit care, even from a preoccupied or reluctant caregiver. Should the affective communication within the dyad become disrupted, however, to the degree that the infant experiences his or her own attempts to elicit care as rendered thoroughly ineffective, the secure, ambivalent, or avoidant strategy should break down and become disorganized.

In developing the Atypical Maternal Behavior Instrument for Assessment and Classification (AMBIANCE), Bronfman et al. (1999) operationalized many of the caregiving behaviors that have close theoretical ties to the relational-diathesis model of disorganized attachment. In addition to the spectrum of frightened and frightening behaviors described by Main and Hesse (1990), the AMBIANCE scale also identifies behaviors that indicate a disruption in caregivers' ability to respond in a manner that provides the infant with an effective strategy for eliciting care. Specifically, the AMBIANCE measure consists of five dimensions of disrupted affective communication: 1) affective communication errors; 2) role-reversal/boundary confusion; 3) fearful, dissociated, or disorganized behavior; 4) intrusiveness/negativity; and 5) withdrawal (See Table 1 for examples) Frequencies of specific behaviors measured within each of the five

dimensions, and a global score ranging form 1 (optimal) to 7 (highly disrupted) is assigned on the Level of Disrupted Communication Scale as an indication of overall level of disruption. On the basis of the global score, each dyad is given the bivariate classification of "disrupted" or "not disrupted."

Table 1: AMBIANCE Dimensions of Disrupted Affective Communication

1. Affective errors
   a. Contradictory cues; for example, invites infant to approach then distances
   b. Nonresponse or inappropriate response; for example, does not offer comfort to distressed infant

2. Role confusion (items from Main & Hesse, 1992; Sroufe et al., 1985)
   a. Role reversal; for example, elicits reassurance from infant
   b. Sexualization; for example speaks in hushed, intimate tones to infant

3. Disorientation (items from Main & Hesse, 1992)
   a. Confused or frightened by infant; for example, exhibits frightened expression
   b. Disorganized or disoriented; for example, sudden loss of affect unrelated to environment

4. Negative-intrusive behavior
   a. Verbal negative-intrusive behavior; for example, mocks or teases infant
   b. Physical negative-intrusive behavior; for example, pulls infant by wrist

5. Withdrawal
   a. Creates physical distance; for example holds infant away from body with stiff arms
   b. Creates verbal distance; for example, does not greet infant after separation.

The AMBIANCE system was originally applied to an at-risk sample of 65 low-income mothers and infants (Lyons-Ruth et al. 1999). Results indicated that mothers of disorganized infants displayed significantly higher levels of overall disrupted communication, with the dimension that coded for affective errors being the most important of the five subscales. Importantly, their study also demonstrated cross-situational stability of maternal behaviors observed during the Strange Situation, as the AMBIANCE measure was significantly correlated in the predicted directions with maternal involvement and hostile-intrusive behavior observed in the context of naturalistic mother-infant interactions in the home. Moreover, all three hypothesized mechanisms through which caregiving behavior is proposed to influence the development of infant disorganization (i.e., frightened/frightening behavior, failure to repair, and competing strategies) each received empirical support in the original study using the AMBIANCE (Lyons-Ruth et al., 1999).

Recently, the usefulness of the AMBIANCE has been further supported by additional empirical findings of other researchers. In a recent unpublished doctoral dissertation, Grienenberger (2001) found a significant relation between high levels of disrupted maternal communication and disorganized infant attachment in a middle-class, "low risk" sample. In replicating Lyons-Ruth et al.'s (1999), Grienenberger's results suggested that the measure had utility that extended beyond high-risk, maltreated samples. In addition, by studying the connections between levels of disrupted maternal communication and mothers' capacities to comprehend or "mentalize" their infant's minds, Grienenberger's (2001) findings provided empirical support for the previous theorizing linking parental mental representations with attachment-related caregiving

behaviors. Specifically, he found that mothers who had greater capacity to appreciate their infants' mental states demonstrated significantly lower levels of disrupted communication during interactions with their infants during the Strange Situation. As previously noted, caregiving behaviors associated with different developmental outcomes are known to be present during the early weeks of life; thus, it is hoped that by adapting the AMBIANCE measure to assess younger infants, it would allow future research to examine links between disrupted affective communication and factors such as maternal capacity to understand infants' mental states at earlier phases of development.

V. Summary

For the purposes of this study it is essential to note that AMBIANCE was developed to assess interactions between parents and their 12 to 24-month-old infants. This is an important limitation given that levels of disrupted affective communication associated with the development of disorganized infant attachment have been observed as early as the first few weeks of infancy. Therefore, in order to more fully understand the etiology and stability of atypical caregiving behaviors and their role in the infant developmental outcomes, one of the major aims of this study involved modifying the original version of AMBIANCE in order to measure maternal disrupted affective communication with younger infants (i.e., six months and younger). Examples of atypical caregiving behaviors include affective communication errors (e.g., parent's smiling and laughing in response to infant distress), role confusion (e.g., parent's demanding affection from infant), unexplained/contradictory expressions of fear (e.g., parent's simultaneously greeting and backing away from infant) and intrusive/negative behaviors (e.g., teasing

infant).). The modification and new application of the AMBIANCE will be achieved by integrating and operationalizing constructs integral to early affective communication between infants and caregivers.

Specifically, this study investigated the stability and predictive validity of atypical caregiving behaviors with 4- and 14-month-old infants and how these behaviors relate to infant attachment. Previous studies have established that high levels of atypical caregiving behaviors are significantly linked to the development of disorganized infant attachment in both socioeconomically low-risk and high-risk samples (Grienenberger, Kelly, & Slade, 2001; Lyons-Ruth et al., 1999). Assessing level of atypical caregiving behavior with 14-month-old infants was achieved through using the Atypical Maternal Behavior Instrument for Assessment and Classification (AMBIANCE) developed by Bronfman, Parsons and Lyons-Ruth (1999). Assessing level of atypical caregiving behavior when the infants are 4-months-old was achieved through the modification of this measure.

VI. Aims of the Study

1. To modify the original Atypical Maternal Behavior Instrument for Assessment and Classification (AMBIANCE) developed by Bronfman, Parsons, and Lyons-Ruth (1999) in order to be able to measure disrupted affective communication during face-to-face interactions between caregivers and 4-month-olds.
2. To evaluate the validity of the modified version of the AMBIANCE scale by testing the following hypotheses:

a. AMBIANCE scores measured at age 4 months with the modified instrument will be significantly related to the AMBIANCE scores measures at age 14 months by the original instrument.

b. Mothers of infants classified as being disorganized with respect to attachment will demonstrate significantly higher AMBIANCE scores during face-to-face interactions with 4-month-old infants than infants classified as secure, avoidant, or anxious-resistant.

c. Mothers of infants classified as insecurely attached in the Strange Situation will demonstrate significantly higher AMBIANCE scores during face-to-face interactions with 4-month-old infants than infants classified as securely attached.

CHAPTER III

Method

I. Sample

The present study is based on data collected as part of a larger ongoing study of parent-infant attachment funded by the National Institute of Child Health and Human Development (RO1-HD24676-05; Principal Investigator, Arietta Slade, Ph.D.). Participants were 51 first-time mothers and their infants, who were recruited during pregnancy through distributing announcements at doctors' offices, maternity shops and childbirth classes, as well as advertisements placed in local parent newspapers. Participation in the study included visits during pregnancy, as well as postpartum visits when infants were 4, 10, 14, and 28 months old. Mothers were reimbursed $20.00 for their participation each time they visited the laboratory. Informed consent was provided and Internal Review Board clearance was granted.

Participants were an average of 31.8 weeks pregnant upon initial contact with the project, and their ages ranged from 25-40 years old, with a mean of 31.4 years. The sample was predominantly Caucasian (94%); of the remaining subjects, 3 were African-American and 1 was of mixed racial background. All subjects were middle-class, living in the New York City area, most were married, and all were living with partners in stable relationships. The group was highly educated, with approximately 90% having graduated from college and over 50% having pursued post-baccalaureate studies. 94% were working prior to conception, and 83% stated they planned to work after their baby's birth.

All of the babies participating in the study were healthy. Of the infants born in the sample, 51% were girls and 49% were boys. Ninety-one percent of mothers elected to breastfeed, and at one month, 75% reported that breastfeeding was proceeding smoothly, with the remaining 25% reporting mild feeding difficulties. While 23% of the participants acknowledged depressive symptoms at one month, none of the mothers reported significant levels of postpartum depression.

II. Setting

The data were collected in a psychology laboratory on the campus of the City College of New York. The laboratory included an interview room, outfitted with comfortable lighting, a rug, tables and chairs. A second room was decorated with posters, chairs, and was supplied with many age-appropriate toys for infants and toddlers. On one side of this room there was a one-way mirror, separating if from a room containing video camera equipment that was used for videotaping mother-infant interactions, including the Strange Situation.

III. Data Collection Procedure

This study uses data collected during the 4-month and 14-month visits. When infants were 4-months old, mothers were asked to come to the laboratory and participate in a 5-minute face-to-face interaction with their infants, which was videotaped with two video cameras using split-screen technology. During the face-to-face procedure, mothers were instructed to sit across from their 4-month-old infants, and interact with them in the same manner as they would at home. Level of disrupted affective communication at 4-

months was assessed by using the modified AMBIANCE measure to code videotapes of mother-infant pairs engaged in a face-to-face interaction.

Mothers were asked to return to the laboratory when their infants were 14-months old. During this visit, each, mother infant pair was videotaped participating in the Ainsworth Strange Situation. These videotapes were used to assess infants' attachment classification, as well as for assessing the level of disrupted affective communication between mothers and their 14-montholds using the original version of the AMBIANCE scoring system developed by Bronfman and colleagues (1999).

IV. Measures

A. The Strange Situation

Infant attachment security and organization was assessed using Ainsworth's Strange Situation, which consists of eight separation/reunion episodes presented in a standard order for all subjects. The procedure, usually conducted between the ages of 12 to 24 months, exposes infants to incrementally increasing stressors that are designed to elicit their attachment behavior system. After a brief introductory episode, the baby is observed with his mother in the unfamiliar, but otherwise non-threatening surroundings of the observation room, to see how readily he or she will explore a novel environment. While the mother is still present, a stranger enters and makes a very gradual approach to the baby. Only after this, does the mother leave, because it is anticipated that separation from her will constitute a greater stress than the presence of a stranger and/or of an unfamiliar environment per se.

After a few minutes the mother returns and the stranger quickly departs. The mother is instructed to interest the baby in the toys again, in the hope of restoring his exploratory behavior to the baseline level characteristic of when he was previously alone with his mother. Then followed by a second separation, and this time the baby was left alone in the unfamiliar environment. As some check on whether any increased distress was a response to being alone rather than to have been separated a second time, and also to ascertain whether separation was more distressing than the presence of a stranger, the stranger returned before the mother finally returned.

The Strange Situation is widely recognized for its reliability and validity as a measure of infant attachment (van den Boom, 1997; Waters et al., 2000). Infants in the present study were assigned to one of the four primary attachment classifications: Secure, Avoidant, Anxious-Resistant, or Disorganized. Within each of the groups, further subgroups could also be assigned. However, data analysis for the current sample will be based only on primary classifications. Jude Cassidy, Ph.D. and her associates at Pennsylvania State University viewed all of the videotapes in order to ascertain infants' Strange Situation classifications. Dr. Cassidy is regarded as an internationally recognized expert in the area of attachment who has published numerous papers utilizing Ainsworth's Strange Situation. Dr. Cassidy trained all coders to reliability. The overall rate of agreement for A, B, C classifications were 88%, and 65% when the D (disorganized) category was included.

In addition to using the Strange Situation to assess infants' attachment classification, the present study also used the mother-infant interactions that occur during the procedure as the basis for measuring levels of maternal disrupted affective

communication with infants at age 14 months. Lyons-Ruth, Bronfman, and Parsons (1999) have provided empirical evidence demonstrating how the Strange Situation can provide an optimal opportunity to observe the parental caregiving system in action. Maternal behavior during the Strange Situation is regarded as particularly relevant as it provides an opportunity to observe the manner in which caregivers either regulate or fail to regulate infants' high levels of affective arousal during a period of distress. Lyons-Ruth and colleagues developed a coding system for evaluating caregiving behavior during the Strange Situation, which is described below.

B. Measuring Atypical Caregiving Behaviors at 14 Months

The Atypical Maternal Behavior Instrument for Assessment and Classification (AMBIANCE, Bronfman et al., 1999) was designed to assess disrupted affective communication as exhibited by the caregiver during the Strange Situation. Bronfman et al.'s (1999) coding system was developed in order to assess various types of parental behavior that have been hypothesized to be associated with disorganized infant attachment. This was achieved by synthesizing and integrating the observations of atypical caregiving behaviors noted by Main and Hesse (1990), Main and Solomon (1990), and Parsons (1991).

After developing a list of behaviors, Bronfman et al. (1999) sorted the behaviors descriptively before organizing them into groups describing five dimensions of atypical behavior (Appendix A lists 138 items included in the AMBIANCE and their original sources). The AMBIANCE scale assesses five behavioral dimensions: 1) Affective Communication Errors; 2) Role or Boundary Confusion; 3) Fearful, Disoriented,

Dissociative or Disorganized Behavior; 4) Intrusive or Negativity; and 5) Withdrawal. Each of the five dimensions contains specific lists of approximately 30 to 40 commonly identified behaviors that were drawn from actual Strange Situation data during the development of the scale. These lists are not intended to be exhaustive, and the coder is permitted to consider additional atypical behaviors as they emerge during the course of coding a given tape.

The AMBIANCE coding system yields various scores for a given dyad, including 1) total frequency of observed atypical behaviors (referred to as AMBIANCE total score), as well as subtotals for each of the five dimensions; 2) a qualitative score based on the AMBIANCE's Level of Disrupted Communication Scale, ranging from 1 ("High normal" or optimal) to 7 ("Disrupted communication with few or no ameliorating behaviors;" and 3) Parental Classification, a bivariate classification indicating the presence of "Disrupted" or "Not Disrupted" affective communication for each dyad. The Parent Classification is derived from the Level of Disrupted Communication score; with scores of 1 to 4 designated "Not Disrupted" and 5 to 7 designated "Disrupted."

The AMBIANCE measure was originally applied to a sample of 65 mothers and their 18-month-old infants who were videotaped during the Strange Situation (Lyons-Ruth et al., 1999). The sample was designed to include a high percentage of dyads considered to be socioeconomically "at-risk" and likely having a higher number of infants with disorganized attachment compared to a low risk sample. Consistent with their expectations, mothers of disorganized infants exhibited increased rates of disrupted affective communication. Significant correlations were also found between the total frequency of atypical caregiving behaviors and a 5-point scale that measured the degree

of infant disorganized attachment behavior, r =. 39, p<. 01. Further validating the findings just mentioned, Grienenberger (2001) applied the scale to a sample of 44 socioeconomically low-risk mother-infant pairs, and likewise, found a significant relationship between high levels of disrupted affective communication and disorganized attachment in infancy. These findings suggest that the AMBIANCE measure's utility has specific value in predicting attachment status independent from socioeconomic status.

Prior to undertaking the modification of the AMBIANCE measure, the present investigator, in conjunction with another advanced doctoral candidate in clinical psychology, were trained in the original version by Elisa Bronfman, Ph.D. and Karlen Lyons-Ruth, Ph.D., two of its three authors. Training began with an intensive weekend seminar followed by ongoing training that continued over a six-month period utilizing Strange Situation videotapes that were previously scored by Dr. Bronfman. After the training phase was completed, both coders blindly and independently completed the scoring of 19 videotapes that were previously coded by expert coders. Both coders successfully achieved high levels of agreement with the expert coders (r= .76 and .77), and permission was obtained to begin coding the 14-month data point of the present sample using the using the original version of the AMBIANCE measure. Inter-rater reliability in coding the 14-month data point of this study was checked at regular intervals. The ICC (2,1) was .84 for the Level of Disrupted Communication Scale and .80 of the AMBIANCE total score. It also should be noted that throughout the coding process, all three raters involved in this study (i.e., K. Kelly and J. Grienenberger coding 14 month data; K. Kelly and J. Ueng-McHale coding 4 month data) remained blind to attachment status, history, and demographic data. In addition, the present investigator

(K. Kelly) did not score data obtained at both data points (4 months and 14 months) for the same dyad. The level of interrater reliability achieved using the modified version of AMBIANCE is reported in the results section.

CHAPTER IV

Results – Part 1

Instrument Development and Reliability

Aim One

The first aim of the present study was to modify the original version of the Atypical Maternal Instrument for Assessment and Classification (AMBIANCE) scale in order to measure disrupted affective communication between caregivers and very young infants (<6 months). Thus, the approach used to modify the original scale and findings related to its application constitute the primary "results" of this study. Accordingly, this chapter 1) provides an overview describing the process involved in modifying the original scale; 2) presents findings related to interrater reliability; 3) explains the rationale for the age parameters recommended for the appropriate use of the modified coding system; and 4) provides a comparative analysis of each of the five behavioral dimensions used in both the 4-month and 14-month versions of the AMBIANCE coding system.

Modifying the Original Instrument

For the purposes of the present study, it is important to reemphasize that the AMBIANCE measure (Bronfman et al., 1999) was developed to assess parent-infant interactions with infants who are between the ages of *12 and 24 months*. Due to the very different developmental demands of young infants (i.e., infant 6 months old and younger), Bronfman and colleagues regarded the direct application of the original

AMBIANCE measure, without modification and further training, as impractical and inappropriate. Given that atypical caregiving behaviors can be readily observed as early as the first several weeks of infancy, the modification of the original measure seemed a worthwhile undertaking. Accordingly, one of the central tasks of the present study involved modifying the original version of the AMBIANCE measure in order to be able to assess levels of atypical caregiving behaviors between mothers and their 4-month-old infants.

The first step in this process involved becoming reliable and well versed in the use of Bronfman et al.'s (1999) original version of the AMBIANCE measure. Training and reliability in the original measure was accomplished in collaboration with Drs. Lyons-Ruth and Bronfman as described in Chapter 3. Prior to initiating any modifications, I proceeded to acquire a significant amount of additional experience applying the original version so that I could understand how the instrument behaved in fuller, more comprehensive terms. Thus, after achieving a high level of reliability in the use of the original measure, I achieved additional experience using the original version of the AMBIANCE measure by scoring 37 out of the 51 mother-infant pairs included in the 14-month data point of the present sample. In other words, the 14-month data used in this study was coded using the original AMBIANCE measure (Bronfman et al., 1999) before the modification process even began.

The next step in the project involved my synthesizing and integrating essential concepts related to parent-infant interaction/communication interactions with very young infants (i.e., ages 0 to 4 months) into the existing version of AMBIANCE. Several theoretical constructs that play essential organizing functions in early infant-caregiver

interactions, as described in Chapter 2, were operationalized and incorporated into the application of the modified system. The modified AMBIANCE measure utilizes observations of atypical behaviors noted by researchers studying very young infants, including Beebe & Lachmann, (1988), Gergely and Watson (1999), Jaffe and colleagues (2001), Stern (1985), and Tronick (1989). For the modified version, I also adapted and operationalized atypical behaviors associated with disorganized infant attachment as observed by Main and Solomon (1990), Main and Hesse (1990), and Parsons (1991). Adhering to Bronfman et al.'s (1999) model, I also included other behaviors that are described in the literature as highly atypical and found to be related to child maltreatment (Crittenden, 1985; Sroufe, Jacobvitz, Mangelsdorf, DeAngelo, and Ward, 1985). Examples of these items that were used in the modified manual include behaviors such as instances when the caregiver interacts with the infant in a sexualized manner (Sroufe et al., 1985), as well as occasions when the caregiver ignores cues that an activity is not liked or is too difficult for the infant (Crittenden, 1985).

Following Bronfman and colleagues (1999) example, after listing these behaviors, I grouped them together descriptively and then integrated each item into one of the five behavioral dimensions of atypical behavior identified in the original version of the AMBIANCE measure. A few items were also added when atypical behaviors were observed that had not been specifically identified in previous research. It should be noted that this part of the process was undertaken in direct consultation with Elisa Bronfman and Karlen Lyons-Ruth, two of the three original authors. Appendix A provides a complete list of items used in rating atypical caregiving behaviors in the modified AMBIANCE, as well as their original sources.

Next, I reviewed and adapted many of the existing descriptions of atypical behavior in the original AMBIANCE in order to make them congruent with normative developmental qualities that characterize interactions between parents and 4-month-old infants. For example, the original version of AMBIANCE specifies that atypical behaviors include caregiver-infant interactions in which the caregiver responds to the infant's distress with stimulation. In operationalizing this criterion for use with caregivers interacting face-to-face with infants 3 to 6 months old, it was useful to specify that atypical behaviors should include caregiving behaviors that interfere with the infant's attempts to self-regulate (e.g., the infant's temporarily averting its gaze away from the caregiver or using self-touch for comfort).

Like the original instrument, the modified AMBIANCE coding system yields various scores for each dyad, including 1) total frequency of observed atypical behaviors (referred to as AMBIANCE total score), as well as subtotals for each of the five dimensions; 2) a qualitative score based on the AMBIANCE's Level of Disrupted Communication Scale, ranging from 1 ("High normal" or optimal) to 7 ("Disrupted communication with few or no ameliorating behaviors;" and 3) Parental Classification, a bivariate classification indicating the presence of "Disrupted" or "Not Disrupted" affective communication for each dyad. The Parent Classification is derived from the Level of Disrupted Communication score; with scores of 1 to 4 designated "Not Disrupted" and 5 to 7 designated "Disrupted."

Aside from those already mentioned, the modification process required additional changes in order to accommodate the fact that infants at 4 months of age are dramatically less mobile than 12 to 24 months. Thus, unlike the mother-infant pairs participating in

the Strange Situation at 14 months of age, all parent-infant interactions at age 4 months took place with the dyads facing each other in a sitting/reclining position. In addition the mother-infant pairs at 4 months had no access to the numerous toys that are available in the Strange Situation playroom, the use of which often played an important role in coding behaviors using the original AMBIANCE measure. These differences required changing the coding criteria such as, "caregiver moves away from infant" to "sits back in chair instead of sitting upright (≤ 90 degrees) or leaning forward."

It should be noted that both the original and modified versions of AMBIANCE not only code the *presence* of atypical behaviors, but also code the *absence* of expectable responses. For example, if an infant's cough or sneeze went unacknowledged by the caregiver, such an omission would be coded as atypical. Furthermore, consistent with the procedures of other research assessing parent-infant interactions (Rothbaum & Schneider-Rosen, 1991; Bronfman, Parsons, & Lyons-Ruth, 1999), each discrete behavior observed was coded every time it occurred. Such as, if a caregiver poked the infant's nose with her forefinger several times, each action was recorded as a separate atypical behavior.

The final major stage of the modification process involved applying the measure in its adapted format to 38 videotapes of mothers interacting face-to-face with their 4-month-olds to a sample that is demographically similar sample to the one used in the current study. This process was invaluable in terms of providing the present investigator with ample opportunity to operationalize and compare the experience of applying the modified version relative to the original in order to better appreciate both fundamental and subtle differences between them. As a result of this process some of the items of in

the modified were adapted, and some of the descriptions were reworded in order to be as clear as possible. During this phase of the project, I periodically attended lab meetings headed by Dr. Beatrice Beebe, an infant researcher with three decades of experience assessing various aspects of face-to-face interactions between mothers and young infants. During these meeting I engaged in discussions that were quite helpful in clarifying the application of various criteria, as well as in helping me articulate key concepts related to the coding system prior to initiating training with a clinical psychology doctoral student without previous experience in coding mother-infant behavior. It is also noteworthy to add that I had more than 5 years of experience coding various aspects of videotaped face-to-face interactions between mothers and infant prior to undertaking this project.

Training Another Coder Using the Modified Instrument

Finally, after accomplishing all of the intermediate steps outlined above, I began training another clinical psychology doctoral student, Jasmine Ueng-McHale (JUM), who had a strong interest in mother-infant interactions, but no formal previous experience. This training and reliability phase consisted of regular weekly meetings that took place over a 7-month period. During this time, we (JUM and KK) reviewed 26 of the 38 videotapes that I had previously viewed and coded several times in order to provide JUM with sufficient experience in accurately identifying each of the atypical behaviors listed in the modified AMBIANCE coding manual. In addition to identifying atypical behaviors, training required learning how to assess the overall Level of Disrupted Affective Communication in order to provide a reliable dimensional score (1 to 7) indicating the degree of disrupted mother-infant communication.

In order to assist us in using the AMBIANCE tool in a reliable manner, I implemented and practiced specific coding procedures during the training phase of the study. In coding the videotapes of mother-infant interactions at ages 4 and 14 months, raters adhered to the following instructions:

1. Watch the videotape in its entirety without writing anything down.
2. Watch videotape again, pausing and rewinding as necessary in order to see and hear each interaction fully.
3. While pausing and rewinding, write down each atypical behavior as observed on the videotape. This is done while referring to the AMBIANCE manuals (both the original and adapted versions) as often as needed in order to produce a detailed, comprehensive list describing each instance of atypical maternal behavior (this was expected to take anywhere from 30 minutes to 3 hours per tape).
4. Add up the total number of atypical behaviors demonstrated in each videotape
5. Use the list of coded behaviors and, if necessary, review portions of the videotape again in order to assign a global score designating the level of disrupted affective communication as outlined by the AMBIANCE manuals.
6. For mother-infant pairs that are assigned a score of 5 or higher, specify the interaction as being most consistent with Lyons-Ruth's "hostile," "helpless," or "mixed" subtypes.

Inter-rater Reliability

An essential early task was determining whether or not I could effectively teach the modified AMBIANCE coding system to another person and achieve sufficient levels of interrater reliability. During the training phase of the project, I reserved 12 of the 38 training videotapes (i.e., face-to-face interactions of mothers and 4-month-olds) for the purpose of establishing preliminary inter-rater reliability between the two coders (KK and JUM). On these training reliability tapes, the intraclass correlation coefficient (2,1) was .85 the Level of Disrupted Communication scale and .72 for the AMBIANCE Total frequency. Following the training phase, both coders proceeded to blindly and independently score 18 videotapes randomly chosen from the present sample. Interrater reliability was checked at regular intervals, and the ICC (2,1) on this sample was .77 for the Level of Disrupted Communication scale and .71 for the AMBIANCE Total frequency. Both raters were blind to attachment status, demographic data, as well as the to the AMBIANCE scores assigned when the infants were 14-months-old.

Establishing Appropriate Age Parameters for the Modified Instrument

Given that a baby's developmental abilities undergo dramatic changes during the first two years of life, developing tools for use with this age group requires researchers to give a great deal of care and consideration to ensuring an appropriate developmental match between research instruments and the age of the infants being studied. Due to a well-established developmental change in neurological function occurs at the end of the second month of life, 8-weeks was elected as the younger age limit for using the modified AMBIANCE measure. This neurological "growth spurt" is associated with a dramatic

transformation in the way infants interact with social partners. This transition is clearly marked by the onset of social smiling (Wolff, 1987), as well as cooing and prespeech movements (Trevarthen, 1979). The 8 week marker is also strongly associated with (1) a sudden increase in the amount of time spent in alert, active states (Wolff, 1987); (2) the ability to maintain visual attention and explore internal features of the face (Acerra, de Schonen, and Burnod, 1999); and (3) improvements in head control and hand-eye coordination (Hopkins, Lems, Van Wulfften Palthe, Hoeksema, Kardaun, & Butterworth, 1990). These developmental changes, as well as their effect on caregivers' behavior, provide the infant with enriched possibilities for complex face-to-face engagements with others. Additionally, 24-weeks was determined to be the older age limit because, prior to this age, most infants have not achieved high levels of independent locomotion, a development that has a significant influence on infant behavior during face-to-face interactions.

Comparative Analysis of 14-Month and 4-Month Coding Systems

The following several pages provide detailed information demonstrating many of the salient differences between the original and modified versions of the AMBIANCE measure. Tables 2 through 6 list several descriptions of atypical behaviors for each of the five dimensions utilized in both versions of the AMBIANCE measure: 1) Affective Communication Errors; 2) Role or Boundary Confusion; 3) Fearful, Disoriented, Dissociative or Disorganized Behavior; 4) Intrusive or Negativity; and 5) Withdrawal. In order to appreciate how developmental differences influence the application of these coding criteria, the tables provide side-by-side examples of behaviors that were coded as atypical at both 4-month and 14-month data points. These tables demonstrate how the different developmental capacities at these ages are necessarily accounted for and reflected in the function of both the original and modified versions of the AMBIANCE coding system.

Table 1: AMBIANCE Modifications ~ Affective Communication Errors

Coded AMBIANCE Behaviors	Applied to Interactions with 14-Month-Olds	Applied to Interactions with 4-Month-Olds
(1) Caregiver ignores infant's bid for attention	• Does not respond to infant's signal to be picked up • Does not respond to infant's bid to share toy with caregiver	• Does not respond to infant's vocalization • Does not respond to infant's moving limbs in an excited manner
(2) Caregiver ignores infant's distress	• Does not offer comfort when infant falls • Puts down infant who is still crying	• Does not acknowledge infant's fuss • Does not acknowledge infant's sigh
(3) Caregiver interferes with infant's attempt to self-regulate	• Interferes with distressed infant's hair twisting or thumb-sucking	• Interferes with infant's attempt to avert gaze • Pulls infant's fist out of his or her mouth
(4) Caregiver dismisses or minimizes infant's distress	• Upon reuniting after a brief separation, caregiver responds, "What's wrong?! There's no reason to cry"	• Responds to infant's distress with, "Don't cry, you're okay, you're okay, no need to cry."
(5) Caregiver responds to distress with positive or inappropriate affect	• Responds to distressed infant by laughing and trying to engage infant in a game.	• Responds to infant distress by smiling even wider rather than engaging in vocal rhythm matching/facial mirroring.

As mentioned above, the purpose of Tables 2-6 is to illustrate how the application of AMBIANCE coding criteria (column 1) required developmentally sensitive interpretations in order to account for the marked developmental differences between 4-month-olds and 14-month-olds, as well as for differences in the experimental procedures (i.e., mother-infant face-to-face interactions vs. Strange Situation) For example, criterion #1, as listed above, indicates that raters should note occasions when the caregiver ignores the infant's bid for attention code them as atypical. Due to their different developmentally capacities, 4-month-old infant's bids for attention are much

more subtle than bids made by 14-month-olds. The 14-month-old's independent locomotion allows him or her to approach the mother in order to elicit a response, while a 4-month-old's bids usually consist of vocalizations, as well as head and limb movements. Accordingly, it is essential that coders of each system be knowledgeable concerning these differences.

Other differences in applying the measures related to criterion #2: caregiver ignores infant's distress. In the context of the Strange Situation, a small subset of infants expressed low levels of distress and wariness upon first being introduced to the playroom; however, nearly all 14-month-old infants who exhibited observable levels of distress did so in response to one or both separation episodes. As a result, if upon reuniting with their infants, a mother ignored, dismissed or otherwise ineffectually responded to their infant's distress, such maternal behaviors were usually robust and readily coded as atypical.

In contrast, the effective application of this criterion to 4-month-olds required a different approach due to the different nature of the face-to-face procedure. Infant crying was a fairly high base rate behavior during this procedure, and in the context of being videotaped and evaluated by infant researchers, virtually every mother responded to it. Thus, salvaging the utility of this criterion for use with 4-month-olds required that raters be sensitive to more ambiguous forms of distress, such as when mother didn't respond to an infant's sigh, brief fuss, or protest.

In applying criteria within the Affective Communication Error dimension to 4-month-olds, the coders also relied heavily on operationalizing the concepts of contingency and match. In other words, coders needed to be mindful of whether maternal

behaviors were based on detecting and responding to the infant's behavior in a contingent fashion, AND whether the magnitude and quality of the mother's response affectively well-matched that of the infant. So if a mother responded contingently to an infant's cue, but the response was poorly matched, such a behavior would be coded as atypical. For example, the most common example of this was when an infant would vocalize a fuss sound and the mother would respond with a smiling, brightly intonated response, such as "Hi!"

Table 2: AMBIANCE Modifications ~ Role/Boundary Confusion

Coded AMBIANCE Behaviors	Applied to Interactions with 14-Month-Olds	Applied to Interactions with 4-Month-Olds
(1) Caregiver attempts to elicit comfort from infant	• Makes verbal request, such as "give Mommy a kiss," or "Mommy needs a hug"	• Caregiver takes infants hands or feet and uses them to stroke or press against his or her own face.
(2) Caregiver asks for permission or defers to infant	• Asks for permission to leave the playroom and defers to infant's attempts to delay caregiver's departure	• Asks for permission to perform a necessary parenting function (e.g., buckling the safety belt on the baby seat)
(3) Caregiver behaves as a child rather than a parent	• Competes with infant to play with a favorite toy	• Speaks to infant in an excessively babyish, childlike manner (should not be confused with "motherese")
(4) Interacts with the infant in a sexualized manner	• Greets infant with a prolonged kiss on the lips.	• Caregiver leans over and whispers in infant's ear, "who's mommy's loverboy, who's mommy's loverboy"
(5) Overresponds to the infant's displeasure	• Offers excessive apologies upon reuniting with infant after a brief separation, possibly criticizing self (e.g., "I'm so sorry, I'm such a terrible mother!)	• Is excessively apologetic when performing a parenting task (e.g., wiping drool from infant's mouth)

Generally speaking, applying the criteria listed under the Role and Boundary Confusion dimension required less modification compared to the others. Whether the mother was overresponding to the infant's displeasure by apologizing excessively for having departed from the playroom at 14-months or in response to wiping drool from the infant's mouth, the coder's approach to identifying such behaviors was fairly similar for both coding systems. The same held generally true for the other sample criteria listed above.

One exception, however, relates to a Dimension 2 criterion that is not listed, "Caregiver makes repeated self-references." While the original version of AMBIANCE instructs raters to code a caregiver's repeated self-references (e.g., "show your toy to mommy," "yes, mommy likes that") during the Strange Situation. Nonetheless, similar self-referencing is a very high base-rate behavior during face-to face interaction at age 4 months (e.g., "mommy loves you, that's right, mommy loves you very much"), thus lacking the same usefulness as an indicator of role/boundary confusion when assessing younger infants. This example illustrates how the issue of base rate needed to be given careful consideration during the modification process. While this particular criterion was not eliminated, the modified version of AMBIANCE required that it be applied more conservatively, such as when caregivers repeatedly refer to themselves in a manner that suggested they were self-focused in a manner that excluded or overrode the needs of the infant.

Table 3: AMBIANCE Modifications ~ Fearful and/or Disoriented Behaviors

Coded AMBIANCE Behaviors	Applied to Interactions with 14-Month-Olds	Applied to Interactions with 4-Month-Olds
(1) Caregiver indicates fear of the infant	• Raises hand to mouth directly upon reuniting with infant after brief separation • Backs away from infant as infant approaches	• Facial expression appears frightened and/or alarmed in response to infant's starting to fuss. • Facial expression appears frightened or anxious when infant averts gaze away from caregiver
(2) Caregiver speaks to infant with a high-pitched or "haunted" voice	• Greets infant, after brief separation using a squeaky, stammering voice, "Hel, hel, hello there" (if present, almost always occurs directly upon reuniting with infant)	• Ineffectively attempts to use vocal rhythm matching to soothe infant • Uses a squeaky, staccato, and/or unusually high-pitched voice
(3) Caregiver rapidly shifts from one activity to another	• Attempts to engage infant with toys, but switches from toy to toy in a rapid, frantic manner	• Attempts to distract infant from being distressed by moving frenetically from one activity to another (e.g., playing patty-cake, "bicycling" infant's feet, to making "raspberry" sounds in rapid succession)
(4) Caregiver handles infant as though inanimate	• Picks up infant like he or she is a "sack of potatoes" • Picks up and puts down infant like one moves a chair	• Touches infant in a somewhat rough manner, like he or she was a toy

The coding dimension in Table 3, Fearful and/or Disoriented Behaviors required a significant amount of revision in order to be effectively applied to interactions with 4-month-olds. Again, some of the differences were a direct byproduct of the laboratory situation in that the face-to-face context of the 4-month interaction offered coders the tremendous advantage of having full frontal visual access to the mother's face for the entire duration of the videotaping. As a result, it was significantly easier to detect

mothers' fearful and alarmed facial expressions in response to the infant's distress. Such facial expressions, even fleeting ones, appeared to be a manifestation of tension during the interaction, and were coded as atypical using the modified system.

Another significant difference in applying this dimension is related to the fact that, unlike the original version, the modified coding system explicitly incorporated the concepts of vocal rhythm matching and facial mirroring. During the process of viewing and reviewing videotapes during the development of the modified version of the coding system, for some dyads it became possible to discern instances of maternal facial mirroring and vocal rhythm matching that was temporally uncoordinated at what appeared to be clinically significant level. For these dyads, the mother's vocal and facial responses lacked appropriate levels of coordinated timing and contingency. While observing these dyads, it was interesting to note that if one viewed the tape strictly looking at the mother and ignoring the infant, the quality of the interactions often appeared relatively fine. In other words, there was nothing intrinsically problematic about the behaviors themselves, except that they simply didn't match what the infant was doing. From a qualitative perspective, it seemed almost as if the mother was interacting with a different baby than the one that was immediately in front of her. In part due to this reason, and a clinical sense that this behavior was somehow connected to a mild state of dissociation, these types of behaviors were regarded as most appropriately placed in the "Fearful and Disoriented" behavioral dimension rather than under "Affective Communication errors.

Table 4: AMBIANCE Modifications ~ Intrusive and/or Negative Behaviors

Coded AMBIANCE Behaviors	Applied to Interactions with 14-Month-Olds	Applied to Interactions with 4-Month-Olds
(1) Caregiver interacts with infant in intrusive and/or aggressive manner	• Directs infant's movement by pulling him or her by the wrist • Tosses toy or other object at the infant	• Wipes infants nose unnecessarily or in a manner that is too vigorous. • Pokes infant anywhere in the face or stomach • Turns infant's head (e.g., to have infant look at her)
(2) Engages in rough play without infant enjoyment	• Engages in roughhousing without infant enjoyment (or persists too long after initial enjoyment ceases)	• Plays a game of "tickle" without infant enjoyment (or persists too long after initial enjoyment ceases)
(3) Attributes negative motivation to an innocuous behavior	• Responds to infant's action (e.g., throwing toy at caregiver) as if it was an intentional attempt to cause pain (when infant's behavior seems benign or ambiguous)	• Responds to infant's averting gaze by saying, "so you don't like me anymore"
(4) Directs infant to a new activity while clearly engaged	• Removes toy from infant's hands and replaces it with another one	• Directs infant away from looking at something in the environment (e.g., video camera, picture on the wall)
(5) Caregiver frightens infant	• Suddenly moves towards the infant in a manner that causes infant to back away or exhibit fearful expression	• Startles infant while playing peek-a-boo • Infant appears fearful in response to caregiver's grimacing, scowling, or baring teeth

Compared to applying the AMBIANCE coding system to mother-infant interactions during the Strange Situation, assessing whether or not behaviors should be regarded as "intrusive and/or negative" at 4-months required coders to be highly sensitized to the infant's response to any behaviors with intrusive and/or negative potential. For example, just as in applying the coding system to interactions with 14-month-olds, many intrusive and negative behaviors were unambiguous, such as when a

mother would poke the infant in the nose, making him or her flinch; or when a mother would make a statement such as, "You don't want to look like a pig in front of the camera!"

However, coders routinely encountered situations that required keen sensitivity to how the infant appeared to be experiencing even seemingly benign maternal behavior. Some infants, for example, appeared to experience a vigorous game of "bicycle," which typically involved the mother's "pedaling" the infant legs, as a thoroughly blissful experience. In contrast, for other infants, the game was clearly too overstimulating, thus giving the interaction an intrusive quality. Thus, the same behavior that was regarded as innocuous in one mother-infant interaction would have been coded as atypical for another, depending on the infant's response.

Also, in terms of gauging the significance of such behaviors in terms of assigning a score using the Level of Disrupted Communication Scale, coders needed to assess these behaviors in light of the question – Did the mother persist with the behavior in spite of the infant's communicating signals that he or she was becoming overstimulated and distressed, and if yes, to what degree? In addition, it is noteworthy that while demonstrating the coding system for others, it has become apparent that this particular dimension seemed to be appreciably more vulnerable than the others to being "contaminated" by a prospective coder's own personal style and preferences for interacting with others. A person who prefers more reserved modes of interaction rather than effusive ones may be at risk for "over-coding" behaviors in this dimension; and likewise a person who prefers more effusive styles of interactions over reserved ones may be at risk of "under-coding."

Table 5: AMBIANCE Modification ~ Withdrawal Behaviors

Coded AMBIANCE Behaviors	Applied to Interactions with 14-Month-Olds	Applied to Interactions with 4-Month-Olds
(1) Creates physical distance from infant	• Pulls or picks infant up by arms not torso and/or holds infant out away from own body • Holds infant so that he or she faces away from caregiver • Uses props/toys to keep infant at a distance • Crosses arms across lap or otherwise obstruct infants access to it	• Sits back in chair instead of sitting upright (≤ 90 degrees) or leaning forward • Averts gaze away from infant • Physically interacts with infant minimally or in a tentative, reluctant or subdued manner • Does not pick up infant who is in hard cry
(2) Maintains distance using verbal communication	• Uses words to create distance (e.g., "No, I will not pick you up" or "Go over there and play") • Upon reuniting with infant after brief separation, dismisses infant's feelings (e.g., Why are you upset, there's nothing wrong")	• Does not make verbal attempt to engage infant when infant has been disengaged (e.g., allows infant to continue gazing away for a too prolonged period of time) • Refers to infant using the third person

The Withdrawal Behavior dimension was applied to interactions with both 4- and 14-month-olds in order to help detect interactions that may be imbued with a distancing quality. Generally, this dimension contains behaviors that were among the more challenging to identify and assess owing to the fact that the coder was typically attempting to account for behavioral qualities that were absent from the interaction rather identifying behaviors in conjunction with active cues demonstrating their presence. Nonetheless, in some respects it was less difficult to code this dimension at age 4 months due to the face-to-face context. This is because in the Strange Situation at 14-months mothers are instructed to sit quietly in the playroom, typically perusing magazines, and

to interact with the infant only in response to the infant's initiatives. Thus, in the absence of the mother's withdrawing and/or demonstrating distancing behaviors/verbalizations in response to infant bids, coders typically interpreted low levels of maternal interaction as cooperating with the investigator's instructions.

In contrast, due to the face-to-face nature of the experimental situation at 4-months, in which the mother was instructed to interact with the infant as they would at home, low levels of interaction became more salient. Accordingly, in addition to coding the distancing behaviors like the ones listed above, the task for the coders often became one of determining what level of interaction was "too low;" meaning when was "quiet" behavior interpreted as "subdued," thereby rendering it codable. Fortunately, during the development phase of this project, it gradually became apparent that this dilemma often could be resolved with help from the infant. That is, if the mother demonstrated low levels of interaction when the infant was active or distressed, such behavior was coded as atypical. However, if the infant was in a quiet or dampened state, the coder would be alert to whether or not the mother made sensitive, nonintrusive bids to engage the infant. In the presence of such bids the mother's quiet behavior was not regarded as atypical. But if the mother, too, remained quiet and her attempts to engage the quiet/subdued infant were deemed insufficient, the interaction (or lack thereof) was assessed as atypical.

CHAPTER V

Results – Part 2

Stability and Predictive Validity

Aim Two

The second aim of the study was to evaluate the validity of the new version of the instrument by investigating the stability and predictive validity of maternal AMBIANCE scores. Thus, the second section of the chapter describes empirical results associated with the hypotheses developed to assess the validity of the revised scale. Results include statistical analyses measuring the stability of atypical parental behaviors between ages 4 and 14 months, as well as how level of disrupted communication at 4 months relates to infant attachment classification at 14 months.

Hypothesis One

The study's first experimental research question examined the issue of the stability of maternal disrupted affective communication between ages 4 and 14 months as assessed by the global AMBIANCE score. Accordingly, the study's first hypothesis predicted that there would be categorical stability in disrupted affective communication (Disrupted vs. Not Disrupted) between 4-months and 14-months. Categorical stability was tested in two ways. A chi-square analysis (see Tables 7) showed that there was a significant association of disrupted/not disrupted affective communication status between 4-months and 14-months (chi-square = 10.49, df=1, $p<.003$). Additionally, the modified version of AMBIANCE demonstrated a moderately large level of test-retest stability

between 4- and 14-months as indicated by a Kappa of .45 ($p<.001$) months (Fleiss, 1987; Landis & Koch, 1977). These findings indicate that the level of atypical caregiving behaviors between 4 months and 14 months was significantly stable, thereby providing evidence suggesting the value of being able to assess the quality of affective communication between infants and caregivers at early ages.

Table 7: Association Between AMBIANCE Status at 4 and 14 Months

Parent Affective Communication	Parent Affective Communication: Not Disrupted 4 months	Parent Affective Communication: Disrupted 4 months	Row Total
Not Disrupted 14 months	32 (83.3%) (86.1%)	7 (16.2 %) (46.2%)	39
Disrupted 14 months	4 (41.7%) (13.9%)	8 (58.3%) (53.8%)	12
Column Total	36	15	51

Chi-square (n = 51, df = 1) 10.49, $p < .003$.

Hypothesis Two

Using the Strange Situation coding procedure (Ainsworth et al., 1978; Main & Solomon, (1990), the fifty-one infants in this study were classified as Secure, Avoidant, Anxious-Resistant, or Disorganized. The distributions were as follows: 25 were classified as Secure (49%); 8 were classified as Avoidant (18%); 5 were classified as Anxious-Resistant (10%); and 10 were classified as Disorganized (23%). The second experimental research question, designed to test the validity of the modified version of the AMBIANCE developed for this study, addresses the relation between level of disrupted maternal communication measured at age 4 months and the infants attachment status with regard to security versus insecurity. The study's second hypothesis predicted that mothers of infants classified as insecure would be more likely to have disrupted levels of affective communication as measured by the modified AMBIANCE system at age 4 months than mothers of infants with secure attachment classifications. A chi-square analysis (see Table 8) showed that there was a significant association between secure/insecure attachment status and disrupted/not disrupted affective communication status during mother-infant interactions at age 4 months (chi-square = 5.05, df=1, $p<.02$). Given the strong history of empirical evidence supporting the link between maternal sensitivity and infant attachment status, this finding provides support for the validity of the modified instrument used in this study.

Table 8: Association Between AMBIANCE Status at 4 months and Infant Attachment Security

Infant Attachment Security	Parent Affective Communication: Not Disrupted 4 months	Parent Affective Communication: Disrupted 4 months	Row Total
Secure 14 months	21 (84%) (60%)	4 (16%) (25.0%)	25
Insecure 14 months	14 (54%) (40%)	12 (46%) (75.0%)	26
Column Total	35	16	51

Chi-square (n = 51, df = 1) 5.38, $p < .02$

Hypothesis Three

The third experimental research question, designed to test the validity of the modified version of the AMBIANCE developed for this study, addressed the relation between level of disrupted maternal communication measured at age 4 months and attachment organization. The study's third hypothesis predicted that mothers of disorganized infants would be more likely to have disrupted levels of affective communication as measured by the modified AMBIANCE system at age 4 months than mothers of infants with organized forms of attachment (i.e., secure, avoidant, anxious-resistant). A chi-square analysis (see Table 9) showed that there was a significant association between organized/disorganized attachment status and disrupted/not disrupted affective communication status during mother-infant interactions at age 4 months (chi-square = 5.83, df = 1, $p<.025$). Thus, these findings suggest that the presence of high levels of disrupted affective communication at age 4 months was highly related to the presence of disorganized attachment at age 14 months. Given that the development of the original version of AMBIANCE was based on behaviors based on Lyons-Ruth's (1999) relational-diathesis model of disorganized attachment, the above finding provides additional support for the validity of the modified version of AMBIANCE used in this study.

Table 9: Association Between AMBIANCE Status at 4 months and Infant Attachment Organization

Infant Attachment Organization	Parent Affective Communication: Not Disrupted 4 months	Parent Affective Communication: Disrupted 4 months	Row Total
Organized 14 months	32 (82.6%) (94.1%)	7 (18.4 %) (58.0%)	39
Disorganized 14 months	6 (50.0%) (5.9%)	6 (50.0%) (42.0%)	12
Column Total	38	13	51

Chi-square (n = 51, df = 1) 5.35, $p < .025$.

CHAPTER VI

Discussion

There were two central findings associated with this study. The first finding was that Bronfman and colleagues' (1999) Atypical Maternal Behavior Instrument for Assessment and Classification (AMBIANCE) could be successfully modified in order to assess disruptions in affective communication between caregivers and 4-month-old infants. Each of the five dimensions used in the original instrument was effectively adapted in order to make them developmentally congruent with the interactive capacities of younger infants. The second finding was that high levels of disrupted affective communication at age 4-months, as measured by the modified AMBIANCE coding system, were significantly related to both attachment security and attachment organization.

The findings of the present study were theoretically consistent with those of previous studies investigating the relationship between maternal responsiveness and attachment (DeWolff & van IJzendoorn, 1997; Grienenberger, Kelly, & Slade, 2001; Isabella & Belsky, 1991; Pederson, Gleason, Moran, & Bento, 1998), thus providing additional empirical evidence showing that infants experiencing disrupted levels of affective communication are at greater risk of developing insecure and disorganized patterns of attachment. The results of this study also extend the findings of previous research by providing important empirical evidence demonstrating that atypical caregiving behaviors previously linked to disorganized attachment in older infants can be measured effectively when infants are *only 4-months-old.* Given that attachment patterns

in infancy are widely regarded as not consolidating until infants are approximately 12-months-old, the ability to assess behavioral factors significantly related to disorganized attachment at age 4-months has major implications for research, clinical intervention and even for the prevention of disorganized attachment and its associated developmental risks.

I. Core Themes Emerging from the Development of the Instrument

The idea for this dissertation stemmed from the observation that many of the criteria in the original version of the AMBIANCE coding system used to assess interactions during the Strange Situation could also be applied to face-to-face interactions between caregivers and much younger infants. At its inception, I initially approached the project with a small amount of self-conscious skepticism, for at the outset it seemed that it might not be possible to adapt a tool originally developed for use with 12- to 24-month- in order to make it developmentally congruent for use with much younger infants and retain the critical elements that made it a useful research tool. Shortly after actually sitting down with the preliminary version of the modified manual and a relatively short stack of videotapes, it readily became apparent that the work ahead would require my taking into account a set of fairly complex considerations in order to achieve a modified AMBIANCE scale that was both empirically valid and clinically meaningful. Ultimately, it seemed that whether or not a modified version would be useful was an empirical question worth pursuing.

Several concerns deserving consideration emerged during the project. These included the need to appreciate the role of base rates in helping to differentiate atypical

behaviors from normative ones when assessing maternal interactions with infants at ages 4 and 14 months. Another core aspect of modifying the coding system involved learning to weigh the significance of any given atypical behavior by observing its impact on the infant. For as expected, even seemingly sensitive caregivers demonstrated at least moments of misattunement and/or intrusiveness. Therefore, what often emerged as much more important than whether these behaviors were present or not, was the degree to which mothers could perceive the impact of their interactions on their babies and calibrate their subsequent responses accordingly. Finally, during seemingly countless hours of videotape viewing, I came to appreciate more thoroughly the degree to which contingency and affective mirroring, as discussed in Chapter 2, constituted two of the most crucial factors in evaluating the 4-month mother-infant interactions. Thus, the following pages discuss some of the central themes that emerged from the data and how the results of this study served to further underscore their foundational significance in assessing and understanding interactions between young infants and caregivers.

A. Awareness of High and Low Baserate Behaviors

Throughout this project, ever present was the awareness that I was attempting to develop an instrument that would facilitate distinguishing the interactions of well-functioning dyads from those of less well-functioning dyads, through assessing varying levels of disrupted affective communication. Additionally, I was quite mindful that only efforts aimed at developing coding items that would successfully distinguish between these two types of dyads might also yield discernible differences associated with organized and disorganized infant attachment classifications. Accordingly, good common

sense dictated that a successful modification required that "atypical" behaviors should be *more often* encountered in parent-infant interactions where there was greater overall levels of relational tension and *less often* encountered in parent-infant interactions where there was lower overall levels of relational tension.

In light of these concerns, one of the first issues that needed careful attention during the process of modifying and synthesizing various items contained in the original AMBIANCE coding system was that of baserates. That is, it was necessary to distinguish high baserate behaviors from low baserate behaviors because high baserate behaviors presumably lacked adequate sensitivity and specificity in differentiating well-functioning mother-infant dyads from less well-functioning ones. Some of the baserate differences in that needed to be accounted for were related to developmental changes that occur between ages 4-months and 14-months. For example, as mentioned in Chapter 4, I much more commonly encountered caregivers making repeated self-references (e.g., "Mommy loves you so much," "Show your belly to Mommy," etc...) during face-to-face interactions with 4-month-olds than during mother-infant interactions with 14-month-olds. Furthermore, reviewing dozens of 4-month-old videotapes revealed that repeated self-references regularly occurred in dyads that otherwise had relatively low levels of disrupted affective communication.

It became apparent that in order for parental self-references to be regarded as atypical in the modified version of the AMBIANCE coding system, the item needed to be applied more conservatively, such as when caregivers repeatedly referred to themselves in a manner that suggested they were self-focused to a degree that seemed to exclude or override the needs of the infant. While milder versions of repeated self-referencing were

noted, such behaviors were weighed much less heavily when we assigned an overall disruption score using the Level of Disrupted Communication scale included in the AMBIANCE coding system.

It is also essential to highlight the fact that neither the original nor the modified AMBIANCE measures purport to provide an all inclusive list of behaviors, and that the atypical behaviors used to assess level of disrupted affective communication should be restricted to these. Instead, the coding manuals are intended to provide detailed guides that describe the kinds of behaviors one may likely encounter when attempting to assess and comprehend the interactions that often transpire between babies and caregivers. That being said, in order to protect their value as research tools, it became essential when coding behaviors not explicitly listed in the manual to carefully heed the issue of baserates by conscientiously assessing whether the prospective item(s) contained adequate sensitivity and specificity to add value to the coding aims.

Finally, it is important to emphasize that the mother-infant pairs participating in this study were from socioeconomically low-risk backgrounds. Thus, when assessing what constituted "atypical" behavior I was viewing videotapes where the majority of dyads had relatively low levels of disrupted affective communication. In retrospect, this arrangement appears to have provided a vital advantage by rendering atypical behaviors, in fact, more readily distinguishable as *atypical*, thereby providing the good fortune of making them more salient and readily identifiable. Distinguishing "typical" from "atypical" might have been much more difficult if I had modified the AMBIANCE coding system using a clinical sample of high-risk mother-infant pairs (e.g., mothers diagnosed with borderline personality disorder). This observation also suggests that there

may be a distinct gain associated with initially learning the coding system using a sample that includes a sufficient number of low-risk, well-functioning dyads order to avoid the problem of over coding (i.e., "over-pathologizing") behaviors that, in fact, may be normative.

B. Coding Maternal Behaviors in Response to Cues from Infant

During the process of coding data, the pivotal role of infant responsiveness emerged as a central factor in this study. While the AMBIANCE coding system was ostensibly used to code atypical maternal behaviors, in practice, it was actually the infant's behavioral response that routinely served at the primary guide for determining when specific maternal behaviors should be deemed atypical. In the end, the model used for coding AMBIANCE at 4-months was fundamentally dyadic, as frequently the only way to assess whether any given maternal behavior was misattuned, poorly coordinated, intrusive, and/or noncontingent was to observe the effects of such behaviors on the infant and gauge the magnitude of the infant's response.

During the period spent observing mothers and babies, I progressively came to view the dyadic process as a feedback-regulated control system in which each partner communicated information that informed and influenced the interactive dialogue. In some sense, each 4-minute videotaped interaction could be thought of as its own story, jointly told by the mother and infant. My job as the coder was to perceive their unfolding improvisations, and whether or not each partner seemed to be "listening" to the other and responding in a way that supported ongoing engagement and avoided unnecessary dissonance. Coding was then based on these responses. For example, if a mother kissed

her infant while the infant was looking down, seemingly in a dampened or neutral affective state, and the infant responded by averting his gaze 90 degrees, the kiss would be coded as atypical behavior. In contrast, the same kiss applied to an infant who, in that moment, appeared to be well-regulated clearly would not be coded as atypical. Thus, often the focus of coding was not always assessing the behaviors in and of themselves, but rather the contextual factors related to their expressions. In this manner, infant cues proved invaluable. I should also emphasize, however, that any caregiver who was responding to a fussy, dysregulated infant in a manner that was reasonably sensitive and responsive was not penalized if their concerted efforts to soothe the infant were ultimately unsuccessful. In the face of what was observed to be sensitive caregiving, an infant's inability to use the caregiver's ministrations in order to return to a more regulated state was not given much weight when evaluating the dyad's overall quality of affective communication.

This approach was heavily influenced by the mutual regulation model (Gianino & Tronick, 1988; Sander, 1995; Tronick, 1989), which stressed that infants depend on caregivers to help modulate levels of physiological-affective arousal, and well-coordinated affective expressions between caregivers and infants during face-to-face interactions facilitate the infant's transition from mutual regulation to self-regulation. The creation of dyadic systems of well-coordinated affective communication presupposes that both baby and caregiver are able to accurately perceive critical nonverbal elements of interaction that communicate information about the other's state of consciousness (Tronick, 1997). Studying videotaped mother-infant interactions using the modified AMBIANCE coding system provided the opportunity to assess and measure the

caregiver's ability perceive and respond to nonverbal cues, such as "I like what we are doing and I want it to continue," or "I don't like what is happening and I want something else now." Thus, often it was not merely evaluating a collection of discrete maternal behaviors, but rather the overall quality of the unfolding nonverbal dialogue between mother and infant that ultimately determined whether and the degree to which any caregiving behavior would be regarded as "disrupted" or not.

C. Central Role of Contingency and Affective Mirroring

In this project, atypical mother-infant interactions were usually discerned by identifying caregiving behaviors that discouraged or interfered with optimal levels of interacting. During the process of modifying the original AMBIANCE coding system, it became apparent that it was the combination of contingency and affective mirroring that proved most essential in assessing the quality of affective communication between caregivers and 4-month-olds. As mentioned in Chapter 2, the significance of contingency was proposed by Watson (1972) to explain how human infants adapt to their environment. Researchers have found that while contingency-based stimulation, (e.g., a parent's vocally "matching" an infant's vocalization or acknowledging an infant's sudden hiccup with a "surprised" facial expression) effectively facilitates infant learning, noncontingent stimulation interferes with infant learning (DeCasper & Carstens, 1981). Affective mirroring, in turn, refers to a range of affect-modulating interactive behaviors that produce observable empathic reflections of the infant's affect state. The efficacy of affective mirroring in facilitating the infant's affect-regulation is thought to be predicated

on the caregiver's sensitivity and willingness to modify his or her responsiveness based on perceptions of the infant's affective communication.

These two features emerged as most salient because nearly all of the dyads assessed as having disrupted levels of affective communication appeared to suffer from either very imbalanced or altogether insufficient amounts of contingency and/or affective mirroring. Caregivers with disrupted affective communication often tended to engage in behaviors that were noncontingent in relation to their 4-month-old babies' behaviors. Rather than acknowledging their infant's escalating degrees of vocal distress, for example, a small group of caregivers reacted to their infants in an atypical, subdued, under-responsive, noncontingent manner that strongly suggested a powerful sense of helplessness on the part of the caregiver. In other cases, caregivers responded contingently, meaning their responses were clearly temporally related to the infant's behavior, yet the qualities comprising such responses were insufficiently modulated with respect to the infant's affect state. Evaluating the degree that maternal expressions of affect adequately "matched" or "mirrored" those of the infant involved observing a combination of vocal elements including tone, intensity, and duration.

While coding dyads I also observed the seemingly paradoxical effects commonly associated with affective mirroring in that infants experiencing negative affect states were nearly universally better soothed when the caregiver reflected back to the infant a similarly negative affective display (e.g., responding with sad facial expressions and vocal tones) rather than a positive one. Thus, responding to an expression of negative emotion with a corresponding level of negativity (albeit, usually using lower levels of intensity than the infant) proved instrumental in helping infants transform their negative

affective states into more positive ones. In the present study, a caregiver's responding to the infant's negative emotion states with positive affect was one of the most common affective errors that we encountered. The extent to which a caregiver misattuned to the infant's negative affective state and persisted with this response consistently served as a particularly useful element in discerning the existence and degree of disrupted affective communication during mother-infant interactions at age 4-months.

Finally, it is also important to add that the repeated use of the term "atypical" when referring to discrete behaviors associated with disrupted affective communication is inaccurate in one important respect. That is, *virtually all* of the mothers participating in this study engaged their babies using *at least* a few so-called "atypical" behaviors that are listed in the modified AMBIANCE manual (see Appendix B); thus, in that sense, most of the behaviors should not be strictly regarded as atypical or pathognomonic. Ironically, only when atypical behaviors approached becoming typical in terms of characterizing the overall quality of affective communication were dyads assessed as demonstrating a disrupted level of affective communication.

II. Empirical Findings

Upon achieving a modified version of the AMBIANCE coding system and good interrater reliability, the other central aim of the study focused on investigating the modified instrument's validity. This was attained by measuring the stability of disrupted affective communication between ages 4- and 14-months, as well as the relation between disrupted levels of affective communication and infant outcome, with greater disruption being associated with disorganized and insecure patterns of infant attachment.

It was hypothesized that AMBIANCE scores measured at age 4 months would be significantly related to the AMBIANCE scores measured at age 14 months. In order to explore this, maternal behaviors during face-to-face interactions with 4-month-olds were rated using the modified version of the AMBIANCE coding system, and maternal behaviors during the Strange Situation with 14-month-olds were rated using the original version of the AMBIANCE coding system. The correlation between the maternal levels of disrupted communication at 4-months and 14-months was significant ($p < .003$). Thus, mothers who demonstrated higher or lower levels of disrupted affective communication during face-to-face interactions at 4-months were significantly likely to demonstrate correspondingly higher or lower levels of disrupted affective communication during the Strange Situation Procedure when their infants were 14-months-old.

The present study represents the first longitudinal examination of caregiving behaviors that have been closely linked to disorganized attachment. The findings support and extend previous research identifying the first 3 months after birth as a period during which mothers and infants develop interactive strategies that both inform and influence the quality of subsequent mother-infant interactions, especially interactions related to the regulation of affect (Cohn & Tronick, 1987; Feldman, Greenbaum, & Yirmiya, 1999; Tronick, 1989). In this study, not only were characteristic patterns of mother-infant affective communication identifiable at age 4-months, but also these interactions were shown to be stable beyond the end of the infant's first year of life. That the atypical behaviors used to assess the level of disrupted affective communication at both ages have been shown to be related to disorganized attachment contributed additional vital dimensions that will be discussed later in this chapter.

The validity of the modified AMBIANCE coding system was also assessed by investigating the relation between disrupted versus not disrupted affective communication during face-to-face interactions at 4-months and infant attachment classifications assessed at 14-months. The original version of AMBIANCE was developed with the explicit intention of identifying characteristic patterns of parental behavior that have been identified as closely linked to disorganized attachment. Previous studies using the original AMBIANCE measure found that high levels of disrupted affective communication predicted infant disorganized attachment in both high-risk and low-risk samples (Benoit, Madigan, Lecce, Shea, & Goldberg, 2001; Grienenberger, Kelly, & Slade, 2001; Lyons-Ruth, Bronfman, & Parsons, 1999). In fact, in a previous study using the current sample, Grienenberger (2001) found that mothers of disorganized infants displayed an average of more than twice as many instances of disrupted communication as did mothers of organized infants.

In light of these earlier findings, it was anticipated that exploring the relation between 4-month assessments of disrupted affective communication and attachment organization would serve as an important test of the modified coding system's validity. Thus, it was hypothesized that high levels of maternal disrupted affective communication assessed at 4-months would be associated with disorganized attachment; the results confirmed this prediction. The AMBIANCE Level of Disrupted Communication scale in the modified coding system produced significant findings related to infant disorganization. This finding suggests that the behavioral criteria comprising the modified AMBIANCE coding system successfully targeted specific behaviors associated with disorganized infant attachment. In this manner, the measure may capture the nature

of parental behaviors implicated in the process of disorganization, distinguishing them from behaviors associated with organized infant attachment (i.e., secure, avoidant, anxious resistant).

Here, it is important to note that parental behavior that is coded as insensitive using the standard but very global variables for rating parental sensitivity has shown only weak correlations with disorganized infant attachment (see van IJzendoorn, Schuengel, & Bakersman-Kranenburg, 1999). Lyons-Ruth (2003) proposed that the reason for this weak association is most likely due to methodological factors, including the lack of detailed behavioral descriptors in many scales used to rate sensitivity. If accurate, this suggests that while becoming adept in applying the AMBIANCE coding system's detailed descriptors of behaviors may be somewhat involved, it may help explain one of the reasons underlying the AMBIANCE measure's success in predicting disorganized infant attachment.

In addition to providing validation for the modified version and further validation for the original AMBIANCE coding system, the results of the present study also effectively addresses two major criticisms that have been raised regarding Bronfman et al.'s (1999) instrument. The first criticism is related to the fact that the original coding system used the same experimental procedure (i.e., the Strange Situation) to assess both infant attachment classification and level of maternal disrupted affective communication, while asserting that the variables were orthogonal. While all studies using Bronfman et al.'s (1999) instrument have taken measures to ensure that none of the AMBIANCE coders had experience classifying infant attachment, critiques have been put forth suggesting that AMBIANCE coders may inadvertently be "contaminated" through

unavoidably observing infants' disorganized behavior while simultaneously assessing maternal disrupted affective communication during the Strange Situation.

The second criticism, which also relates to the use of the Strange Situation, points to the fact that the videotapes used with the AMBIANCE measure were originally collected with the express purpose of identifying patterns of infant behaviors, not maternal behaviors. This meant that for certain periods of time maternal data was lost when the camera's focus was directed only at the infant. While this artifact of the data collection has not previously been regarded as a terribly grave problem in using the original coding system, it is worth noting that the modified AMBIANCE coding system, which relies upon videotaped face-to-face interactions that use split-screen technology, does not suffer from the same limitation.

III. Implications of AMBIANCE for Attachment Disorganization

Both versions of the AMBIANCE measure were based on a set of three theoretical constructs that comprise Lyon-Ruth's relational diathesis model of infant attachment disorganization. These include the "frightened/frightening hypothesis, the "failure to repair" hypothesis, and the "competing strategies hypothesis. The first of these hypotheses, originally proposed by Main & Hesse's (1990), suggests that the disorganization of infant attachment strategies is related to unresolved parental fears that are transmitted to the infant through parental expressions of frightened and/or frightening behavior. According to Main and Hesse, these behaviors place the infant in an irresolvable dilemma in that the parent becomes both the source of the infant's fear and safe haven, which interferes with the infant's ability to evoke organized strategies for

seeking comfort during times of stress. The atypical behaviors that are the most germane to the frightened/frightening hypothesis are mostly captured within Dimension 3 (Fearful, Disoriented, Dissociative, or Disorganized Behavior) and Dimension 4 (Intrusive/Negative Behaviors) of both versions of the AMBIANCE coding systems.

Lyons-Ruth and colleagues (1999) also put forth the hypothesis that the failure to respond sufficiently to the infant's attachment bids should be treated as important as more active manifestations of frightened or frightening parental behaviors. This view holds that atypical parental behaviors that communicate role-confusion and withdrawal leave the infant without affect-regulating partners, which would be potentially disorganizing, regardless of whether parents' behaviors were directly frightened or frightening. Left alone to struggle with overwhelming affect, these infants are thought to be unable to influence the attachment figure in any predictable or consistent manner, leading to a marked breakdown in organized strategies for eliciting care. The parental behaviors most relevant to this hypothesis were mostly captured within Dimension 2 (Role/Boundary Confusion) and Dimension 5 (Withdrawal) of both versions of the AMBIANCE coding systems.

The third and final premise underlying Lyons-Ruth's relational diathesis model of disorganized attachment is referred to as the "competing strategies hypothesis." This hypothesis is rooted in evidence that parents of disorganized infants exhibit unintegrated mental contents when discussing loss or trauma (Main & Goldwyn, 1999). Parents experiencing a continuing state of fear around attachment needs are likely to display unintegrated or contradictory behaviors towards their infant, much as disorganized infants display unintegrated or contradictory attachment behaviors. Contradictory

caregiving behaviors, such as those that simultaneously heighten and reject the infant's attachment needs, compromise rather than facilitate the infant affect regulation, thereby contributing to a collapse of the infant's organized attachment strategies. The behaviors most relevant to this parenting dynamic were largely captured in Dimension 1 (Affective Communication Errors) and Dimension 5 (Withdrawal) of both versions of the AMBIANCE coding systems.

That the present study was successful in predicting infant attachment disorganization based on identifying behaviors during face-to-face interactions at 4-months has important implications for understanding the developmental antecedents of infant attachment behavior. Based on Main and Hesse's (1990) ideas that exposure to parental frightened/frightening behavior played a key role in the etiology of disorganized attachment, infant researchers began looking for confirmatory evidence in samples of socioeconomically high-risk maltreated infants. Presently, there is a relatively large literature addressing aspects of the adaptation of high-risk (e.g., parental depression or alcoholism) and maltreated infants in relation to attachment research (Carlson et al., 1989; Cicchetti & Barnett, 1991; Cicchetti, Lynch, Schonk, & Todd-Manly, 1992; DeMulder & Radke-Yarrow, 1991; Teti, Gelfand, Messinger, & Isabella, 1995). For example, Carlson and colleagues (1989) found that 82% or maltreated infants displayed disorganized patterns of attachment in relation to caregivers, compared to only 17% of socioeconomically similar controls. In another study DeMulder and Radke-Yarrow (1991) reported that 50% of the infants and preschoolers of mothers suffering from bipolar disorder were classified as disorganized, compared to 25% of children of unipolar depressed mothers, and 18% of children of controls.

Thus, ample evidence exists that infants who are maltreated and/or have parents with mental illness experience high rates of negative parental interactive behavior that, in turn, contribute to high rates of disorganized attachment. These findings would be wholly expected given that disorganized attachment is theorized as rooted in experiences where the frightened/frightening caregiver is simultaneously the source of comfort and alarm for the infant. However, a meta-analysis using a North American low-risk, nonclinical, middle-class sample (n = 1,882) found that the rate of disorganized attachment was still 14% (van IJzendoorn, Schuengel, & Bakersman-Kranenburg, 1999). Therefore, assuming that some percentage of these disorganized infants possessed no obvious risk factors, this fact has prompted infant attachment researchers to pursue other developmental pathways in order to account for the presence of disorganization in the absence of obvious risk. The findings of the present study help these efforts.

This study provides direct evidence suggesting that even relatively subtle forms of disrupted affective communication may contribute to the etiology of infant attachment disorganization. In terms of face validity, most of the atypical behaviors comprising the modified AMBIANCE system would likely not be regarded especially harsh or dramatic in and of themselves. In fact, an untrained person watching a videotaped interaction would most likely experience some initial difficulty in even perceiving a portion of the behaviors that the AMBIANCE system regards as problematic. Thus, the data lend support to the idea that even when relatively subtle forms of parental atypical behavior become a pervasive mode of interacting with the infant, mechanisms underlying disorganized attachment may be triggered. The findings also support the notion that it is not the presence of atypical behaviors per se that relates to disorganized attachment but

rather their presence combined with the caregiver's inability to modify these behaviors in response to the infant's signals.

The present study also has implications for clinical dissociative phenomena that have been associated with disorganized attachment. Based on the predictive strength of the assessment of early mother-infant affective communication, Lyons-Ruth (2003) conducted a study examining the relation between the various subtypes of maternal disrupted affective communication and dissociative symptoms in adolescence. Results found that while all categories of disrupted behavior contributed to the overall prediction of dissociation, high rates of maternal affective communication errors and maternal role-confusion in infancy emerged as the strongest predictors of adolescent dissociative symptoms.

While anecdotal, data from this study support the hypothesized role of disrupted affective communication in dissociative phenomena. In some of dyads where the infant was disorganized and the mother was assessed as having disrupted levels of affective communication, coders observed high levels of strikingly uncoordinated behavior in response to the infant's cues. Temporal forms of uncoordinated behavior, for example, were observed when the maternal responses to infant cues were pervasively delayed and/or premature, foreclosing any opportunity for the interaction to achieve a reciprocal rhythm. While the interactions were not excessively intrusive or withdrawn, the conspicuous mistiming and lack of contingency of the interactions appeared to the observer that the mother, figuratively, was unable "to see" the infant before her. Lyons-Ruth suggests that the parental behaviors captured by the original AMBIANCE coding system provide support for recent attempts to connect dissociative phenomena to features

of the early parent-infant dialogue. Bromberg (1994), for example describes dissociation as an interpersonal rather than an intrapsychic defense. He views dissociated events as rendered unthinkable due to their having been unacknowledged, disavowed or distorted by central caregivers. This reflection is consistent with the notion that many of the behaviors included in the AMBIANCE coding system represent the caregiver's need to distort or distance themselves form the infant's experience in order to avoid a breakdown in their own affect regulation.

In summary, the modified AMBIANCE coding system identifies diverse, complex, yet theoretically cohesive patterns of disrupted affective communication that are highly predictive of infant disorganization. The empirical findings in conjunction with those of Lyons-Ruth and colleagues (1999) and Grienenberger (2001), indicate that the theoretical constructs underlying both versions of the AMBIANCE measure have validity for assessing caregiving interactions with very young infants (i.e. < 6 months), as well as older ones (i.e., 12 to 24 months). In addition, the instrument also has potential to offer insight concerning various developmental precursors that may be related to the etiology of disorganized attachment.

IV. Additional Implications for Theory and Research

While the original AMBIANCE coding system was expressly developed with the aim of identifying parental behaviors that were associated with disorganized attachment, it has theoretical and research implications that extend well beyond the area of attachment. The study's findings emphasize the centrality of negative affect and attempts to regulate affect in day-to-day functioning. While this study focused on identifying

specific behaviors that are indicative of disorganized phenomena, other theoretical and empirical work has provided valuable contributions which pave the way to understanding the interface between behavior and mental states, as well as what kind of factors make some negative mental states so disorganizing.

Tronick and Weinberg (1997) have written about the caregiver's role as providing the infant with regulatory input in a manner that "expands the complexity and coherence of the infant's state of consciousness" (p. 74). During mother-infant interactions there is reciprocal transmission of vital information that is conveyed through affective exchanges. The infant communicates affective information about his state and intentions that are apprehended by the mother. The mother, in turn, responds to this information by providing regulatory support that facilitates the infant's achieving a more complex state of organization. For example, an infant attempting to reach for something that is beyond his immediate grasp vocalizes frustration and briefly glances at his mother. The caregiver responds by pushing the object an inch closer to the infant, facilitating not only the infant's ability to grasp the object, but also the infant's ability to employ affective and gestural communication to achieve a desired end. Tronick and Weinberg (1997) propose that beyond providing scaffolding, such interactions provide the infant's consciousness with increased coherence and complexity, for example, in terms of understanding qualities the nature of agency, intention, and collaboration. They note that Bullowa (1979) observed these phenomena when she documented that infants demonstrated greater behavioral complexity in the presence of others compared to when alone.

The creation of dyadic states that are more complex and coherent than either the mother or infant's state of consciousness alone presupposes that both mother and infant

apprehend critical information concerning the other's state. In a corresponding manner, when mother and/or infant ignore or misinterpret information conveyed by the other, the result is a separate and uncoordinated state that lacks a sense of intersubjectivity. According to these principles, the constructs underlying the AMBIANCE coding system including contingency, affective mirroring, attunement, vocal rhythm matching, etc., constitute an indirect approach to assessing dyadic states of consciousness. Like principles that serve as the theoretical basis for the modified AMBIANCE measure, the dyadic states of consciousness model stresses that if the infant routinely experiences high levels of disrupted affective communication, he or she will be forced to engage self-regulatory patterns that may eventually place constraints on the infant's healthy psychosocial development.

Fonagy has developed a different yet related model of the caregiving relationship that expands on Main's (1991) concept of metacognitive monitoring. While metacognitive monitoring emphasized the caregiver's ability to "think about one's own thinking," Fonagy, coining the term "reflective function," shifted the emphasis to the importance of thinking about thoughts and feelings in both the self and the other. Thus, the reflective function refers to an intrinsically dyadic process that permits individuals to achieve an awareness of complex mental states and understand them in relation to one's own. Fonagy and Target (1998) emphasize that by accurately attributing mental states to others, they begin to experience other people's behavior as meaningful and predictable.

Both Fonagy's model, and the instruments developed to measure reflective function (Fonagy, Target, Steele, & Steele, 1998; Slade, Bernbach, Grienenberger, Levy, & Locker, 2001) have emphasized the perpetual interplay between mental states and

behavior. Presumably, the capacity to understand one's own and others' mental states renders other people's behavior comprehensible, providing invaluable information for guiding subsequent thoughts, feelings and behaviors. Deficits in reflective function make it difficult to step back and respond flexibly and adaptively to the meaningful qualities of one's own and others' behaviors. Fonagy (1999) emphasized that reflective functioning is particularly important in families that are coping with deprivation, trauma, or abuse, supporting it with data showing that all mothers who demonstrated high levels of reflective function and reported high levels of deprivation had securely attached infant, while only 1 out of 17 mothers with low reflective function did so.

The hypothesized relationship between reflective function and behavior has been supported by recent research using Bronfman et al.'s (1999) AMBIANCE coding system. Grienenberger (2001) found that high levels of disrupted affective communication were highly correlated with low reflective functioning. This inverse relationship suggests that mothers who are unable to contemplate their infants' minds in order to assess their mental states are more likely to engage in disrupted levels of affective communication. Grienenberger proposes that mothers who act in grossly insensitive ways may become even more motivated to deny or distort the impact of their behavior on their infant. This has the potential to create a cyclical psychodynamic in which insensitive maternal behavior results in lowered reflective function, which in turn leaves the mother with even fewer mental resources to help her respond sensitively to infant. Not only would the dynamic be deleterious for the infant, but also it might contribute to increasing the infant's negativity that the mother had difficulty dealing with in the first place.

The modified AMBIANCE coding system, even more so than the original version, specifically targets maternal behaviors that are linked to the caregiver's need to deny or distort aspects of the infant's experience. In both research and clinical work, knowledge of AMBIANCE behaviors indicating marked disruption in affective communication may provide a valuable bridge between the realms of mental representations and behavior. Future research aimed at understanding the underlying mechanisms contributing to negative developmental outcomes in infants should investigate the role of reflective function as a mediating factor between disrupted affective communication and attachment disorganization.

V. Clinical Implications

The findings of this study have some important implications for clinical interventions with parents and infants. First and foremost, the results of the modified AMBIANCE coding system indicate that it is possible to assess maternal disrupted affective communication in a valid and meaningful way based on interactive behaviors with 4-month-old infants. This conclusion is consistent with previous research that suggest mothers and infants develop relatively stable patterns of interacting beginning as early as 8 to 12 weeks after birth (Cohn & Tronick, 1987). Given that the procedural knowledge and related mental representations that guide human beings in how to do, think, and feel in a variety of interpersonal contexts generally become only more implicit and consolidated over time, both clinical wisdom and common sense suggest that when parent-infant relationships show early evidence of trouble, *earlier intervention is better.* This is especially true if one's goals are aimed at prevention rather than responding to

maladaptations that have already manifested as psychopathology. Thus, recognizing its potential value as a clinical assessment tool, aside from a research tool, the modified AMBIANCE measure has the decided advantage of having been explicitly designed to detect disrupted affective communication between caregivers and infants as early as the first 8 to 12 weeks of life.

In addition to its value for the early identification of at-risk parent-infant dyads, the modified AMBIANCE measure also has potential value as an intervention tool in terms of guiding treatment. Basic knowledge of the behaviors listed in both the original and modified versions of the AMBIANCE manual can provide clinicians working with parents and babies with valuable early clues suggesting there may be difficulties emerging in the parent-infant relationship. Moreover, given that disrupted affective communication largely occurs outside the parent's conscious awareness, the behaviors identified by the AMBIANCE measure can provide the clinician with an initial point of entry for intervening. Several recent studies have examined the usefulness of video feedback in parent-infant treatment (Bakersman-Kranenburg, Juffer, van IJzendoorn, 1998; Beebe, 2003; Juffer, Hoksbergen, Riksen-Walraven & Kohnstamm, 1997; Zelenko & Benham, 2000).

Beebe (2003) describes a brief parent-infant treatment model that uses videotaped parent-infant interactions as the basis for providing the parent positive reinforcement, modeling, and information giving, as well as psychoanalytically informed interpretations. The intervention focuses on specific interactions in the areas of attention, arousal, affect, and timing regulation are evaluated. In addition, the treatment involves making a concerted attempt to identify specific representations of the baby that may interfere with

the parent's ability to observe and process nonverbal interactions that manifest a disrupted affective communication. The powerful experience of direct self-observation via videotape in the context of a supportive therapeutic relationship is intended to facilitate the parent's capacity to integrate both procedural and declarative modes of information processing.

The modified AMBIANCE measure may also have value for treatments aimed at increasing reflective function. In the past the psychotherapy research literature has been divided concerning whether parent-infant interventions should focus on problematic behaviors or the representations underlying them. Interventions aimed at the level of representation are essential in order to achieve greater depth and complexity than interventions that focus on the level of behavior. At the same time the behavioral manifestations of distorted representations provide the clinician with invaluable clues concerning where the sources of relational tension may lie. The results of this investigation suggest that the atypical behaviors and the representations underlying them may often be inextricably intertwined, making interventions that are aimed at both may be especially effective. Slade (1999), describing the treatment of a young boy and his mother, demonstrated the value of initially making the child's experience and behavior more meaningful to his mother. Later upon having helped the mother to elaborate her representations of her son, she was able to contemplate the ways in which her thoughts, feelings and behavior impacted him.

Finally, it is worth noting that the modified AMBIANCE coding system may also have value as a tool for assessing the effectiveness of parent-infant clinical interventions. In a recent study investigating interactions between mothers and infants with feeding

problems, Benoit and colleagues (2001) used the original AMBIANCE measure to assess the clinical efficacy of two brief intervention methods. Their results showed that AMBIANCE was able to discern differences in the outcomes related to both interventions. Specifically, the parents who received play-focused treatment aimed at observing and intervening in response to maternal sensitivity demonstrated a significant decrease in disrupted affective communication, while a behavioral feeding-focused intervention did not.

In summary, the findings of this study suggest that the modified AMBIANCE measure has numerous implications for clinical intervention with parents and infants. These implications have potential usefulness at the levels of early identification and prevention, as well as intervention. Familiarity with the behaviors that are often associated with disrupted affective communication can facilitate treatment by providing a point of entry for engaging parents with the ultimate goal of understanding the mental representations that underlie the behavior. Finally, as noted above, AMBIANCE also has utility in terms of assessing the clinical efficacy of various parent-infant treatment models.

VI. Suggestions for Improving Measure

While the modified version of Bronfman et al.'s (1999) AMBIANCE proved useful for assessing levels of disrupted affective communication between caregivers and 4-month-olds, there are specific ways the measure could be improved for future use. Collectively reviewing the ratings for each dyad coded for this study revealed that the approach used to code disrupted affective communication was inherently better suited to

discerning the frequencies of more active forms of atypical behaviors rather than more passive ones. That is, for *each instance* a participating caregiver exhibited an atypical behavior, the behavior was coded; and for each dyad the total frequency of atypical behaviors was computed. While this approach worked well for assessing instances of active behaviors (e.g., each time a caregiver criticized or intrusively poked the infant), it was insufficient for measuring passive forms of atypical behavior (e.g., prolonged periods of facial immobility or periods of leaning away from the infant). For example, an instance consisting of a caregiver's face remaining unusually immobile for a period of 20 seconds was assigned a single code for the entire duration, while ten instances of a caregiver's poking her infant's nose over a period of 20 seconds would be assigned 10 codes over the same duration of time.

Future research efforts may be able to mitigate this problem by integrating a time interval component into the coding system. Coding prolonged durations of passive behaviors by breaking them down into five-second intervals, for example, may yield frequencies that are more commensurate with the assessed frequencies of more active atypical behaviors. This alteration in the coding system would also likely produce improved interrater reliability due to the ability to measure passive atypical behaviors with greater accuracy.

A second suggestion for improving the modified coding system relates to identifying behaviors related to disorganized infant attachment. Based on observations from a larger set of mother-infants pairs, Bronfman et al., (1999) were able to identify specific maternal Strange Situation behaviors that occurred almost exclusively in mothers of disorganized infants. Due to the relatively small number of disorganized infants in the

present sample, this study was unable to develop a corresponding set of specific behaviors that were significantly more often found in 4-month face-to-face interactions of mothers whose infants were subsequently classified as disorganized. Thus, it may be useful to aim further efforts at examining a larger sample of disorganized infants, pooling data from multiple sources if necessary, in order to test whether there are behaviors that are significantly more common during face-to-face interactions with disorganized infants. This enhancement may improve the specificity with which the modified coding system can predict disorganized attachment based on much earlier manifestations of disrupted communication during caregiver-infant interactions.

VII. Study Limitations and Suggestions for Future Research

Due to the correlational nature of the study, conclusions addressing the etiology of disorganized attachment are not justified. While existing theories related to attachment disorganization are consistent with the observations found in this study, none of these can be verified on the basis on this study's nonexperimental design. Arguments that address issues of individual differences among infants that influence maternal behavior could also be used to explain the data. Additional limitations affect the study's generalizability. Subjects in this study were non-clinical, socioeconomically middle-class, mostly Caucasian, and in long-term stable relationships. Thus, the generalizability of these results must be treated cautiously until studies using the modified version of AMBIANCE are conducted with more diverse samples.

Another important limitation of the study relates to the lack of infant variables investigated other than infant attachment classification. While this study was not

designed to assess how maternal affective communication or its impact may vary as a function of infant characteristics, it is an important limitation that needs to be acknowledged. Future studies investigating the relation between disrupted levels of affective communication and attachment would benefit if infant characteristics such as irritability, motor activity level, and social engagement level were also assessed. This type of research would be particularly useful in light of other studies that have investigated the value of targeting irritable infants and their parents. Van den Boom (1994), for example, found that a short-term intervention program aimed at mothers of irritable infants had a remarkable impact on infant attachment security 3 months later (66% secure infants in the intervention group vs. 22% secure infants in control group).

APPENDIX A

Sources for the Atypical Caregiving Behavior Ratings

Dimension 1: Affective Communication Errors

Voice tone incongruent with verbal content

- Sweet voice tone while communicating negative message (Crittenden, 1981)
- Stern voice, but permissive message (Parsons, 1991)

Verbal content or voice tone incongruent with facial expression

- Smiles while using stern voice (Crittenden, 1981).
- Displays negative facial expression with pleasant speech (includes tensely pressed or pursed lips) (Bronfman et al., 1999)

Verbal content or voice tone incongruent with physical interaction

- Physically looms over infant (Crittenden, 1981; Main & Hesse, 1990) while communicating positive message
- Engages in "chase and dodge" or otherwise interferes with infant's attempts to self-regulate (Beebe, 2000) while speaking pleasantly to infant
- Directs infant to do something, and then says not to do it or prevents infant from doing it (Parsons, 1991)
- Sits back in chair (does not sit upright or lean forward) while verbally engaging infant

Failure to Initiate Responsive Behavior in Response to Infant's Cue:

- Doesn't acknowledge or otherwise comment on infant's vocal/physical expression of distress (e.g., infant's fussing, crying, negative or "zoned out" facial expression, gaze aversion, arching back, hiccuping, yawning) (Bronfman et al., 1999)
- Doesn't attempt or makes incomplete attempt to soothe infant when distressed
- Ignores infant's distress (Crittenden, 1981)
- Fails to set appropriate limits around safety (Sroufe et al., 1985)
- Doesn't respond to infant's cue for contact (Parsons, 1991)
- Does not respond to physical cue for attention (Bronfman et al., 1999)
- Does not respond to vocal cue for attention (e.g., ignores opportunity to engage in vocal rhythm matching)

Inappropriate Response to Infants Signals or Needs (not coded above):

- Laughs or is overly positive while infant is crying or distressed (Crittenden, 1981; Parsons, 1991)
- Attempts to override infant' negative affect with positive affect (Beebe, personal communication)
- Directs inauthentic affect towards infant (Crittenden, 1981)
- Responds to infant's distress with stimulation (Parsons, 1991; Stern, 1985)
- Engages in physical contact that is not comforting (Bronfman et al., 1999)

- Ignores or interferes with infant's attempts to self-regulate (hand-to-mouth, gazing away, other comforting self-touch) (Beebe, 2000)
- Ignores infant's protest (Bronfman et al., 1999)
- Minimizes or discounts infant's distress (Bronfman et al., 1999)
- Uses too adult-like speech with infant (e.g., lack of affective vocal contour) (Stern, 1985)

Dimension 2: Role/Boundary Confusion

Role Confusion

- Defers to infant (Main, 1985; Sroufe et al., 1985)
- Infant seems to work to engage caregiver
- Asks infant's permission to do something (Parsons, 1991)
- Pleads with infant
- Threatens to cry (Bronfman et al., 1999)
- Fake cries in response to infant (to get attention) (Bronfman et al., 1999)
- Demands show of affection from infant (Sroufe et al., 1985)
- Demands attention from infant
- Overresponds to infant's displeasure/distress (Main, 1985)
- Prioritizes own needs over infant's needs (Sroufe et al., 1985)
- Uses infant to regulate self (e.g., takes infant's hand and presses is against own face) (Beebe, personal communication)
- Treats infant as more powerful than self (Bronfman et al., 1999)
- Encourages infant to engage in negative behaviors (Sroufe et al., 1985)
- Manipulates infants body to achieve something for self (Beebe, personal communication)

Treats Child as a Spousal/Sexual Partner

- Speaks in hushed intimate tones to infant (Sroufe et al., 1985)
- Touches body parts of infant inappropriately (Main, 1985; Sroufe et al., 1985)
- Overemphasizes infant's sexuality (Sroufe et al., 1985)
- Seeks physical attention from infant while infant is engaged in activity (Bronfman et al., 1999)
- Kisses infant in a sexualized manner (Sroufe et al., 1985)
- Strokes infant in a sexualized manner (Sroufe et al., 1985)
- Cups infant's face in hands with extended eye gaze (Sroufe et al., 1985)

Dimension 3: Fearful, Disoriented Behavior

Appears fearful, hesitant, or deferential in relation to infant:

- Exhibits frightened expression (Main & Solomon, 1990)
- Exhibits "haunted or frightened voice (Main, 1985; Main & Hesse, 1990)
- Indicates fear of infant (Main, 1985)
- Indicates infant could harm mother or object (without reasonable cause)
- Interacts with infant in a hesitant fashion
- Leans away from infant, seemingly in fear or alarm
- Handles infant in a timid or helpless manner (Main, 1985; Main & Hesse, 1990)
- Exhibits smile with fearful characteristics (Main & Solomon, 1990)
- Offers object to infant over unusual distance (Main & Solomon, 1990)
- Opens eyes wide enough to show "whites" surrounding eyes as if frightened or alarmed
- Raises shoulders when in contact with infant (Main & Solomon, 1990)
- Exhibits stammering voice quality (Main & Hesse, 1990)
- Exhibits tense, high-pitched, squeaky voice (Bronfman et al., 1999)
- Raises hand to mouth seemingly in fear (Main & Solomon, 1990)
- Exhibits "haunted" sounding voice (Main, 1985; Main & Hesse, 1990)

Disorientation/Dissociation or Disorganized Behavior

- Interactions with infant are strikingly uncoordinated with infant's cues (as if s/he is interacting with a different infant than the one in front of her) (Beebe, personal communication; Gergeley & Watson, 1996)
  Aspects of this kind of disorganization may include:
  - Temporal (caregiver delays too long, or does not wait long enough in order for interaction to seem coordinated/reciprocal)
  - Vocal rhythms (may be too staccato, sluggish, etc...)
- Exhibits sudden change in mood not reasonably related to the environment, including loss of affect (Main, 1985)
- Handles infant as though inanimate (Main, 1985)
- Exhibits rapid shifts in affect (Main, 1985)
- Attempts to engage infant's attention or soothe infant by rapid, frenetic shifts from strategy to strategy (without sufficient trial) (Bronfman et al., 1999; Kelly)
- Voice exhibits sudden drop in pitch (Main, 1985; Main & Hesse, 1990; Parsons, 1991)
- Exhibits sudden loss of affect (Main & Solomon, 1990)
- Displays sudden movement unrelated to environment (sudden head jerk)
- Displays flat affect (prolonged and marked absence of facial mobility) (Lyons-Ruth, personal communication)

Dimension 4: Intrusive/Negative Behavior

Physical Communications

- Looms, or hovers over infant (Crittenden, 1981; Main & Hesse, 1990)
- Presses own cheek to infant's cheek forcefully (Bronfman et al., 1999)
- Wipes infant's nose vigorously (Parsons, 1991)
- Manipulates infants body (e.g., pushes, pulls, restrains infant)
- Behaves aggressively towards infant (Main, 1985)
- Turns infant's head (e.g., to have infant look at caregiver)
- Engages in physically coercive or forceful play (e.g., playing patty-cake in a grabbing manner that seems controlling or aggressive)
- Engages in rough physical play without infant enjoyment (Bronfman et al., 1999)
- Tickles infant when infant resists or expresses displeasure (Bronfman et al., 1999)
- Tosses toy or other object at infant (Parsons, 1991)

Verbal Communications:

- Mocks/teases infant
- Hushes crying infant (distinct from comforting sounds) (Bronfman et al., 1999)
- Uses loud, sharp, or angry tone (Main, 1985)
- Disapproves, criticizes or threatens
- Plays games in a frightening manner (e.g., "I'm gonna get you!!!) (Main, 1985)
- Makes negative comment about infant

C. Inappropriately attributes negative feelings, motivation to infant:

- Suggests negative motivation to innocuous behaviors (Lieberman, 1996)
- Indicates that infant's actions could have harmful consequences (Main & Hesse, 1990)
- Personalizes infant's behavior as negative
- Ascribes negative feelings to the infant (e.g., you don't like me anymore?!) (Bronfman, 1999)

D. Exerts control using objects:

- Removes toy from infant despite engagement (Bronfman et al., 1999)
- Withholds toy from infant
- Directs infant to new activity while infant is clearly engaged (Bronfman et al., 1999)
- Makes infant wait and watch while performing an activity

E. Appears frightening to infant

- Exhibits frightening facial expressions (Main & Hesse, 1990; Main & Solomon, 1990)
- Stretches lips in tense line and/or bars teeth
- Scowls, growls or grimaces while interacting with infant
- Opens eyes wide enough to show "whites" surrounding eyes as if angry or irritated
- Exhibits behavior that seems related to infant's being startled

Dimension 5: Withdrawal

Creates Physical Distance from Infant

- Holds infant away from body with stiff arms (Parsons, 1991)
- Sits back in chair instead of sitting upright (≤ 90 degrees) or leaning forward
- Adopts a posture that functions to keep infant at a distance (e.g., sitting "sideways" in chair)
- Averts gaze away or otherwise avoids direct eye contact (Main, 1985)
- Holds infant so that he or she faces away from caregiver (Parsons, 1991)
- Does not make physical attempts to soothe distressed infant (may only use voice or sit by helplessly)
- Stands up and looks down to interact with infant
- Uses props/toys to keep infant at a distance (Bronfman et al., 1999)
- Indicates touching infant was uncomfortable or unpleasant (Bronfman et al., 1999)
- Holds infant awkwardly (Bronfman et al., 1999)
- Does not pick up infant who is in hard cry
- Pulls or picks infant up by arms not torso and/or holds infant out away from own body (Bronfman, 1999; Parsons, 1991)
- Physically interacts with infant minimally or in a tentative, reluctant or subdued manner
- Redirects infants to toys, pacifiers, and/or environment rather than self as an apparent substitute for contact with caregiver

Maintains Distance Using Verbal Communication:

- Uses inappropriately low levels of verbal interaction with infant
- Uses words to create distance (e.g., "No, I won't pick you up.") (Crittenden, 1981)
- Uses words to communicate helplessness related to situation ("I'm sorry, there's nothing I can do")
- Does not make attempt to engage infant when infant has been disengaged (e.g., allows infant to continue gazing away for a too prolonged period of time)
- Dismisses infant's feelings (e.g., "You're not sad/ there's no reason to be upset") (Parsons, 1991)
- Refers to infant using the third person (Ueng-McHale, personal communication)

Appendix B

AMBIANCE
Atypical Maternal Behavior Instrument for
Assessment and Classification
(Adapted Version for Infants ≈ 6 Months and Younger)

Dimension 1: Affective Communication Errors

Contradictory Signaling to Infant

Voice tone incongruent with verbal content:

- Sweet voice tone while communicating stern, derogatory, demanding or otherwise negative message
- Stern or negative voice with kind, complimentary, or otherwise positive message
- Verbal content or voice tone incongruent with facial expression:
- Displays negative facial expression with unpleasant speech (includes tensely pressed or pursed lips)

Verbal content or voice tone incongruent with physical interaction:

- Physically looms over infant while speaking pleasantly to infant
- Engages in "chase and dodge" or otherwise interferes with infant's attempts to self-regulate while speaking pleasantly to infant
- Directs infant to do something, and then says not to do it or prevents infant from doing it
- Sits back in chair (does not sit upright or lean forward) while verbally engaging infant

Failure to Initiate Responsive Behavior in Response to Infant's Cue

- Doesn't acknowledge or otherwise comment on infant's vocal/physical expression of distress (e.g., infant's fussing, crying, negative or "zoned out" facial expression, gaze aversion, arching back, hiccuping, yawning).
- Doesn't attempt or makes incomplete attempt to soothe infant when distressed
- Fails to set appropriate limits around safety or comments on unsafe situation but fails to take measures to correct it
- Doesn't respond to infant's signal to be picked up (okay not to actually pick up)
- Does not respond to vocal cue for attention (e.g., ignores opportunity to engage in vocal rhythm matching)
- Does not respond to physical cue for attention (e.g., ignores opportunity to engage in facial mirroring)
- Ignores or interferes with infant's bid for agency (e.g., persisting with patty-cake when infant indicates fatigue, disinterest, or desire to do something else)

Inappropriate Response to Infants Signals or Needs (not coded above)

- Laughs or is overly positive while infant is crying or distressed
- Attempts to override infant' negative affect with positive affect
- Responds to infant in manner that is developmentally inappropriate
- Directs inauthentic affect towards infant
- Responds to infant's distress with stimulation
- Engages in physical contact that is not comforting
- Ignores or interferes with infant's attempts to self-regulate (hand-to-mouth, gazing away, other comforting self-touch)

- Ignores infant's protest
- Minimizes or discounts infant's distress
- Uses too adult-like speech with infant (e.g., lack of affective contour).

Dimension 2: Role/Boundary Confusion

(Difficulty in clearly separating infant's needs from own needs)

Role Confusion

- Defers to infant
- Infant seems to be working to engage mother
- Asks infant's permission to do something
- Pleads with infant
- Threatens to cry
- Fake cries in response to infant (to get attention vs. mocking)
- Demands show of affection from infant
- Demands attention from infant
- Overresponds to infant's displeasure/distress
- Prioritizes own needs over infant's needs
- [Makes repeated references to themselves]
- Uses infant to regulate self (e.g., takes infant's hand and presses is against own face)
- Treats infant as more powerful than self
- Uses "we" to describe self or infant
- Encourages infant to engage in negative behaviors
- Manipulates infants body to achieve something for self
- [Speaks for infant in baby voice]
- Speaks using "baby talk" while in caregiver role

Treats Child as a Spousal/Sexual Partner:

- Speaks in hushed intimate tones to infant
- Touches body parts of infant inappropriately (e.g. takes infant's hand and sensually strokes own face)
- Overemphasizes infant's sexuality
- Behaves or speaks to infant more appropriate for a romantic partner
- Seeks physical attention from infant while infant is engaged in activity
- Kisses infant in a sexualized manner
- Strokes infant in a sexualized manner
- Cups infant's face in hands with extended eye gaze

Dimension 3: Fearful, Disoriented Behavior

Appears fearful, hesitant, or deferential in relation to infant

- Exhibits frightened expression
- Exhibits "haunted or frightened voice
- Indicates fear of infant
- Indicates infant could harm mother or object (without reasonable cause)
- Interacts with infant in a hesitant fashion
- Leans away from infant, seemingly in fear or alarm
- Handles infant in a timid or helpless manner
- Exhibits smile with fearful characteristics
- Offers object to infant over unusual distance
- Places an unusual amount of space between self and infant
- Opens eyes wide enough to show "whites" surrounding eyes as if frightened or alarmed
- Raises shoulders when in contact with infant
- Exhibits stammering voice quality
- Exhibits tense, high-pitched, squeaky voice
- Raises hand to mouth seemingly in fear (vs. playful way)
- Startles to infant without reasonable cause
- "Ghost-like" whispering

Disorientation/Dissociation or Disorganized Behavior

- Interactions with infant are strikingly uncoordinated with infant's cues (as if s/he is interacting with a different infant than the one in front of her). Aspects of this kind of disorganization may include:
- Temporal (caregiver delays too long, or does not wait long enough in order for interaction to seem coordinated/reciprocal)
- Vocal rhythms (may be too staccato, sluggish, etc...)
- Exhibits sudden change in mood not reasonably related to the environment, including loss of affect
- Handles infant as though inanimate
- Exhibits rapid shifts in affect
- Gets up out of chair without apparent cause or reason
- Exhibits disoriented facial expression
- Treats inanimate objects as animate
- Attempts to engage infant's attention or soothe infant by rapid, frenetic shifts from topic to topic or strategy to strategy (without sufficient trial)
- Voice exhibits sudden drop in pitch
- Exhibits sudden loss of affect
- Appears confused
- Displays sudden movement unrelated to environment (sudden head jerk)
- Sighs repeatedly

Dimension 4: Intrusive/Negative Behavior

Physical Communications

- Physically crowds, looms, or hovers closely over infant
- Presses own cheek to infant's cheek forcefully
- Wipes infant's nose vigorously
- Manipulates infants body (e.g., pushes, pulls, restrains infant)
- Behaves aggressively towards infant
- Turns infant's head (e.g., to have infant look at her)
- [Pulls infant into a standing position]
- Engages in physically coercive or forceful play (e.g., playing patty-cake in a grabbing
- manner that seems controlling or aggressive)
- Engages in rough physical play without infant enjoyment
- Tickles infant when infant resists or expresses displeasure
- Tosses toy or other object at infant

Verbal Communications

- Mocks teases infant
- Hushes crying infant (distinct from comforting sounds)
- Uses loud, sharp, or angry voice
- Disapproves, criticizes or threatens
- Plays games in a frightening manner (e.g., "I'm gonna get you!!!)
- Makes negative comment about infant

Inappropriately attributes negative feelings, motivation to infant

- Suggests negative motivation to innocuous behaviors
- Indicates that infant's actions could have harmful consequences
- Personalizes infant's behavior as negative
- Ascribes negative feelings to the infant (e.g., you don't like me anymore?!)

Exerts control using objects

- Removes toy from infant despite engagement
- Withholds toy from infant
- Directs infant to new activity while infant is clearly engaged
- Makes infant wait and watch while performing an activity

Appears frightening to infant

- Exhibits frightening facial expressions
- Stretches lips in tense line and/or bars teeth
- Scowls, growls or grimaces while interacting with infant
- Opens eyes wide enough to show "whites" surrounding eyes as if angry or irritated
- Exhibits behavior that seems related to infant's being startled

Dimension 5: Withdrawal

Creates Physical Distance from Infant

- Holds infant away from body with stiff arms
- Sits back in chair instead of sitting upright (≤ 90 degrees) or leaning forward
- Adopts a posture that functions to keep infant at a distance (e.g., sitting "sideways" in chair)
- Averts gaze away or otherwise avoids direct eye contact
- Holds infant so that he or she faces away from caregiver
- Does not make physical attempts to soothe distressed infant (may only use voice or sit by helplessly)
- Stands up and looks down to interact with infant
- Uses props/toys to keep infant at a distance
- Indicates touching infant was uncomfortable or unpleasant
- Holds infant awkwardly
- Does not pick up infant who is in hard cry
- Averts gaze away from infant
- Pulls or picks infant up by arms not torso and/or holds infant out away from own body
- Holds/touches infant awkwardly
- Physically interacts with infant minimally or in a tentative, reluctant or subdued manner
- Redirects infants to toys, pacifiers, and/or environment rather than self as an apparent substitute for contact with caregiver

Maintains Distance Using Verbal Communication

- Uses inappropriately low levels of verbal interaction with infant
- Uses words to create distance (e.g., "No, I won't pick you up.")
- Uses words to communicate helplessness related to situation ("I'm sorry, there's nothing I can do")
- Does not make attempt to engage infant when infant has been disengaged (e.g., allows infant to continue gazing away for a too prolonged period of time)
- Dismisses infant's feelings (e.g., "You're not sad/ there's no reason to be upset")
- Refers to infant using the third person

Scale for Measuring Degree of Disrupted Communication

Numeric points of 1-4 are considered not disrupted and 5-7 are disrupted. As the numeric level increases, so does the level of disrupted communication. The descriptions of atypical behaviors at lower levels of on the scale can be assumed to be

1. No evidence of disrupted communication. The caregiver consistently engages infant in a manner that is sensitive and responsive to the infant's signals

- Tolerates and accepts infant's affective states
- Uses sympathetic voice tone, facial mirroring, and/or vocal rhythm matching
- Flexibly moves with infant between states of more distress and less distress
- Sees infant's perspective and supports it
- Supports infant's attempts to self-regulate
- Responds sensitively and contingently to infant's cues, especially around distress

2. Mild evidence of insensitive, but not disrupted communication. The caregiver is generally sensitive to the infant's signals but may occasionally miss some cues.

- Tolerates and accepts infant's affective states
- Uses sympathetic voice tone, facial mirroring, and/or vocal rhythm matching
- For the most part, moves smoothly with infant between states of more distress and less distress
- Sees infant's perspective and supports it
- Rarely if ever interferes with infant's attempts to self-regulate
- Primarily responds sensitively and contingently to infant's cues, especially around distress
- May occasionally miss opportunities to interact contingently when infant is in a nondistressed state

3. Some evidence of insensitive, but not disrupted communication. In addition to missing some signals from the infant, the caregiver occasionally demonstrates nonoptimal behaviors. Nonetheless, even when present, nonoptimal behaviors are present to a relatively mild degree.

- Responds to most of infant's signals when nondistressed
- Consistently responds to infant's distress with attempts to comfort and soothe
- Interactive errors are consistently met with efforts to repair
- Mild Interactive errors are counterbalanced with ameliorating interactions (e.g., facial mirroring; vocal rhythm matching; supporting infant's attempts to self-regulate, such as the infant's gazing away; making positive or sensitive attributions towards the infant; or demonstrating other evidence of sensitivity or reciprocity.
- May have a little difficulty tolerating negative affect

- May give brief indications of needing to be the focus of infant's attention
- May try to engage infant's attention by being directive or mildly controlling
- May occasionally interfere with infant's attempts to self-regulate, but shortly thereafter recognizes and capitulates to infant's regulatory needs.

4. "Nonoptimal but not disrupted communication" This caregiver may have more difficulty coping and responding to infant's negative affects. There is evidence of insensitive behaviors, and, at times, nonoptimal levels of responsiveness, yet there is a consistent, nonhostile, predictable style of interacting with the infant with ameliorating behaviors.

- Style of interacting with the infant is consistent and predictable
- Does not respond appropriately to some of infants signals when nondistressed
- Interactive errors are not always repaired
- May have difficulty tolerating negative affect
- May sometimes prioritize own needs over infant's needs
- Occasionally interferes with infant's attempts to self-regulate, but eventually capitulates to infant's regulatory needs.
- Interactions may appear arrhythmic in nondistressed situations
- Interactive errors are counterbalanced by ameliorating behaviors, although at times they may be carried out in a somewhat awkward, asynchronous manner manner
- May give brief indication of need for infant to focus on him/her
- Is more prone to responding to distressed infant by using distraction, games, singing, etc...rather than using self (e.g., facial mirroring)

DISRUPTED AFFECTIVE COMMUNICATION

Subtype 1: Intrusive/Self-referential subtype

5. "Disrupted Communication" There is clear evidence of disrupted affective communication. The caregiver displays persistent mixed signals, persistent errors in responding to infants needs, including intrusive and/or negative behaviors. The caregiver's attempts to engage infant are not flexible in terms of responding to the infant's needs, especially when the infant is distressed.

- While the caregiver appears to be trying to interact appropriately, he or she has difficulty diverting from own needs and/or cannot seem to understand/interpret infant's signals
- Has difficulty seeing and supporting the infant's perspective
- Interactions appear arrhythmic at times, with delayed, inappropriate, or absence of response to infant's signals
- Fails to recognize infant's needs or interferes with infant's efforts to self-regulate
- Caregiver expresses feeling distressed in response to infants distress rather than consistently providing "containment" of infant's distress
- May respond in a role-reversing manner, needing to be focus of attention
- Most, but not all, have difficulty providing adequate comfort to the infant, or interacting infant in an intrusive, overstimulating manner.
- Has difficulty repairing interactive errors
- Most have some difficulty using affective communication to soothe distressed infant (i.e., facial mirroring, vocal rhythm matching). Many rely mostly or completely on games and distraction during interactions.
- May respond more appropriately when infant is calm
- Some ameliorating interactions may occur between caregiver and infant

6. "Highly Disrupted Communication" – Disrupted communication predominates as evidenced by persistently controlling, intrusive, negative, or role reversing behavior in response to infant. The caregiver's responses frequently do not match the infant's signaling.

- Demonstrates an inability to tolerate direct expression of upset or distress from the infant, which may result in anger, withdrawal, or mocking ("what, you don't love mommy anymore")
- May display physically intrusive behavior or uses harsh voice tone.
- Interferes with infant's efforts to self-regulate
- Has marked difficulty seeing and supporting infant's perspective during interactions
- Has difficulty diverting from own style or needs which may be exacerbated around infant distress
- Interactions seem arrhythmic, misattuned, with delayed, inappropriate or lack of response to infant's signals

- Quality of interactions are lacking with regard to facial mirroring, vocal rhythm matching, and/or affective attunement
- Affective response to the infant may include indirect or "masked" expressions of negative affect, a lack of affect, or inauthentic affect.
- May present contradictory affective signals to infant
- Behavior may include being fearful, frightening or using unusual voice quality with infant
- Style of interaction may not be predictable
- Has difficulty providing comfort and containment either physically and/or verbally
- Despite these behaviors, there are some attempts, although ineffective, to address infant's needs

7. "Highly Disrupted Communication with few or no ameliorating behaviors" – Disrupted communication predominates with almost no ameliorating behaviors. The caregiver is highly unresponsive, ineffective, or inappropriate in relation to the needs of the infant. Not only do the caregiver's needs take priority, but also the infant's needs are not attended to in any significant manner. There is persistent evidence of mixed affective signals, intrusive behavior, withdrawal, hostility, lack of boundaries, role reversal, and/or disorientation, with little ameliorating contact.

- Caregiver is unable to provide verbal or physical comfort or containment to the infant
- Affective response to infant include direct or indirect expressions of irritation, negative affect, a lack of affect, or inauthentic affect
- Caregiver appears unable to take the infant's perspective
- Caregiver consistently interferes with infant's attempts to self-regulate
- There are few or no ameliorating interactions with the infant
- Contradictory or behavioral cues are communicated to the infant
- May display physical intrusion, negative comments about the infant, harsh voice tone, or teasing/mocking
- May demonstrate an inability to tolerate any direct expression of negative affect, the presence of which elicits withdrawal, anger, or escalating intrusive behavior
- Caregiver's response to the infant may include confusion, disorientation, fear, or unusual voice quality
- Affective misattunement is a pervasive quality during the interaction

Subtype 2: Helpless/Fearful Type

5. Disrupted Communication" – Clear evidence of disruption in affective communication is present. The caregiver demonstrates delayed responsiveness, elevated withdrawal, mildly fearful behavior, confusion or disorientation with the infant. Although little or no overt hostility is displayed, there may be a sense of not enough availability of caregiver to the infant or little assistance to infant in coping with a difficult situation.

- While the caregiver appears to be trying to interact appropriately with the infant, the parent appears hesitant or held back from being more fully responsive
- Most, but not all, have difficulty around comforting the infant. This may appear as delay in response, an abbreviated or incomplete response, sitting back in his/her chair during interactions, or withholding adequate response in a teasing manner
- Attempts at facial mirroring/vocal rhythm matching may have the quality of being, too infrequent, tentative and/or uncoordinated with infant's interactive cues
- The parent appears held back from assuming fully parental stance, including hesitating in initiating interactions or making initiatives but with evidence of tension, inauthentic affect or apprehension.
- May place an undue burden on the infant to initiate or carry on interactions
- May interfere with infant's attempts to self-regulate
- May appear to become increasingly apprehensive and distressed as infant becomes distressed which may be accompanied by a sense of helplessness in knowing how to respond.
- Response to infant may include confusion, disorientation, frightened behaviors or unusual voice quality.
- Caregiver may communicate his/her own distress and desperation by trying to distract infant with a frequent succession of "games" in a rapidly shifting, disorienting manner
- Caregiver may have difficulty and/or communicates a sense of discomfort in using "self" in interactions with the infant.
- Subtle withdrawal from interacting with infant and/or a subtle sense of helplessness in knowing how to comfort, soothe, interact with the infant becomes a feature of the interaction
- Some ameliorating interactions are present

6. "Highly Disrupted Communication" – Disrupted communication predominates interaction. The caregiver demonstrates a lack of responsiveness to cues, confusion, disorientation, withdrawal or fearful behaviors in response to the infant. The general response to the infant appears to lack sensitivity and coordination in that the parent's style frequently does not match the infant's signaling. Although there is little or no overt hostility toward the infant, there may be avoidance of interaction with the infant.

- Demonstrates an inability to tolerate direct expression of affect form the infant which results in abbreviated, ineffective, or inappropriate soothing techniques – seems like "not enough" made available to the infant.
- Attempts at facial mirroring/vocal rhythm matching are too infrequent, tentative, and/or uncoordinated with infant's signaling.
- May use words or actions to try to minimize or deny infant's level of distress interfere with infant's attempts to self-regulate
- Caregiver seems to fail to connect with the infant and/or there may be an empty quality to relatedness
- Caregiver may appear to become increasingly apprehensive and distressed as infant becomes distressed which may be accompanied by a sense of helplessness in knowing how to respond.
- An inappropriate amount of the interactive burden is placed on the infant, which may manifest as unusually long periods of silence between caregiver and infant
- Withdrawal from interacting with infant and/or a sense of helplessness in knowing how to comfort, soothe, interact with the infant is an unmistakable feature of the interaction
- Response to infant may include confusion, disorientation, frightened behaviors or unusual voice quality
- There is little overtly negative affect or intrusiveness
- The parent appears held back from assuming fully parental stance, including hesitating in initiating interactions or making initiatives but with evidence of tension, inauthentic affect or apprehension, especially in response to infant distress
- There may be a "hot potato" quality to physical contact with the infant
- May redirect infant to environment or to games as a way avoiding interacting with infant
- May fail to pick up infant who is in "hard cry"
- May try to place physical distance between self and infant (e.g., leaning back in chair during interaction)
- Despite these behaviors, there are some attempts, although ineffective, to address infant's needs

7. "Highly Disrupted Communication with few or no ameliorating behaviors" – The caregiver is highly unresponsive, ineffective, or inappropriate in relation to the needs of the infant. Not only does the caregiver's needs take priority but also the infant's needs are not attended to in any significant manner. If withdrawal, disorientation, or confusion predominate with few ameliorating behaviors or if there is a lack of responsiveness to distress with little or no attempt to comfort, score as "7." Also score 7 if strong indices of fearful or withdrawing behavior are combined with marked intrusive and self-referential behavior. In this case, consider also intrusive/self-referential type. Differentiation between these two scales may be difficult at this scale point.

- Caregiver is not able to provide verbal or physical comfort to infant
- Affective response to infant includes lack of affect or inauthentic affect
- There is likely a marked withdrawal or lack of response to infant
- Inappropriate burden is placed on infant in interactions
- Parent may demonstrate fearful behavior in response to infant or environment
- Parent appears unable to take the infant's perspective
- There are few or no ameliorating interactions with the infant
- Most caregivers demonstrate an inability to tolerate direct expressions of negative affect, which results in withdrawal, fearful behavior or attempts to silence negative behavior
- Parent's response to infant may include confusion, disorientation, fear unusual voice quality

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