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**MATERNAL DISTRESS REGULATION AND DYADIC REPAIR:
CONTRIBUTIONS TO INFANT SOCIO-EMOTIONAL
FUNCTIONING**

by

SALLY SPITZER

**A dissertation submitted to the Graduate Faculty in Psychology
in partial fulfillment of the requirements for the degree of Doctor
of Philosophy, The City University of New York**

2000

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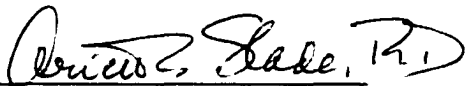
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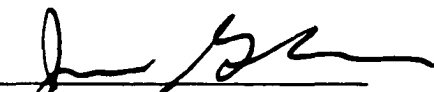
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This manuscript has been read and accepted for the Graduate Faculty in Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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Abstract

MATERNAL DISTRESS REGULATION AND DYADIC REPAIR: CONTRIBUTIONS TO INFANT SOCIO-EMOTIONAL FUNCTIONING

by

Sally Spitzer

Adviser: Professor Arietta Slade

Although mothers' responsiveness is often thought to play an important role in relation to infant socio-emotional functioning, the exact nature of this role has remained unclear. Furthermore, few studies have empirically measured individual differences in maternal responsiveness in the context of an episode of dysregulation and interactive stress. Towards these ends, the present study sought to address these issues by developing a set of maternal emotion regulation strategies and dyadic repair measures, for the purpose of investigating the responses mothers use to repair a state of interactive stress and to regulate infant affect and attention.

This study had two aims. The first aim was to explore how mother-infant pairs negotiate a process of "disruption and repair" (Tronick & Gianino, 1986), using an older age group than had previously been reported in the literature. The second aim was to investigate the specific ways in which maternal characteristics and styles of interaction contribute to the organization of infant socio-emotional functioning. Using a perturbation of mother-infant interaction -- in this case, the still-face procedure -- the reparative strategies and distress-management techniques used by mothers during re-engagement with their infants were measured, as were levels of infant negative affect and subsequent dyadic repair and attachment outcomes.

Thirty-five primiparous mothers participated in the study, which was part of a larger investigation of pregnancy and the mother-infant relationship through the child's third year. Data for the present study was drawn from videotapes of mothers and their 10-month old infants during a standard laboratory still-face procedure (Tronick, Als, Adamson, Wise, & Brazelton, 1978). Based on analyses of reunion behaviors following the still face, infant negative affect and maternal emotion regulation strategies were assessed, and dyads were classified according to *repair* or *non-repair* group. Additional data for the study was drawn from videotapes of these mothers and their 14-month old infants during a standard laboratory Strange Situation (Ainsworth & Wittig, 1969). Based on these analyses, infants were classified according to *secure* or *insecure* infant attachment.

The study found that 10-month old infants, like their younger counterparts, displayed a *carry-over effect* of negative affect following the still face. Maternal responses to infant distress differentiated into affect- and attention-regulating strategies. Attention-regulating strategies included responses like *distraction*, while affect-regulating strategies included responses like *comfort* and *affect-labeling*. Affect-labeling responses were further characterized by negative or positive valence.

Analyses showed that in response to infant state, mothers used *both* attention-regulating and affect-regulating strategies. However, only the affect-regulating strategies were related to subsequent repair. Specifically, *comfort* and *negative affect-labeling* responses were linked to continued distress and dysregulation, while *positive affect-labeling* responses were associated with regulation and repair. A possible re-evaluation of the construct of *maternal sensitivity* was provided, contextualized by developmental and situational factors.

Although mothers' strategy usage did not directly predict attachment status, a substantive trend was found associating successful repair outcome -- and by extension, quality of interaction -- and later infant attachment security. Viewed from an organizational-structural perspective, this finding elicited discussion about the potential organizational pathways connecting maternal characteristics, dyadic repair, and infant regulatory and attachment outcomes.

The data from this study suggest that maternal positivity and maternal capacity to sensitively and effectively repair dyadic disruptions impact favorably upon infant development, and as a result are critical features of healthy parenting. The implications of these findings in terms of planning and implementing clinical interventions were examined, as were suggestions for specific methods of treatment.

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CHAPTER 1

INTRODUCTION

There has been surprisingly little research on the nature of dyadic communication in the latter part of the infant's first year -- as opposed to the first six months, and still less on the consequences of interactive failure and repair during this time. Nevertheless, it is often assumed that the last quarter of the first year is one of enormous transition and change (see for example, Campos & Bertenthal, 1989; Fox, Kagan & Weiskopf, 1979; Kopp, 1982; Ruff & Rothbart, 1996; Schaffer, 1986; Sroufe, 1996). In fact, so many of these changes are thought to occur at 9- or 10-months of age that this time of discontinuity and reorganization has increasingly been regarded as a "major transition point in development" (Ruff & Rothbart, 1996, p. 42).

This period has also been characterized as one that directly precedes the transition from primary sensorimotor functioning (Piaget, 1951) to formal symbolic language and communication (Bruner, 1983). In this regard, it is at this stage of development that simultaneous or discontinuous vocalizations between mother and child give way to topic sharing (Messer, 1978) and turn-taking sequences (Mayer & Tronick, 1985; Schaffer, Collis & Parsons, 1977), and the infant is now able to signal or otherwise follow, initiate, and sustain interactions with the mother (Collis, 1977; Murphy & Messer, 1977; Scaife & Bruner, 1975).

These milestones are also thought to mark the presence or emergence of various other attainments, such as a capacity for intersubjectivity (Trevorthen, 1993); joint attention (Adamson, 1995; Butterworth, 1991; Butterworth & Jarret, 1991; Tomasello, 1995); shared reference (Scaife & Bruner, 1975); intentional

communication (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979; Bretherton & Bates, 1979; Harding & Golinkoff, 1979); and what is now frequently referred to as the infant's developing "theory of mind" (Baron-Cohen, 1991; Bretherton, 1991; Bretherton, McNew, & Beeghly-Smith, 1981) -- that is, the ability to attribute mental states to self and others as a way of understanding and predicting future events and behavior (Tager-Flusberg, Baron-Cohen, & Cohen, 1993).

The latter part of the infant's first year has additionally been described as a period of "focalization" (Sander, 1962) -- that is, an intensification of infant demands upon maternal attention and responsivity; and "secondary intersubjectivity" (Trevarthan & Hubley, 1978) -- or, a state enabling infants to attend to both person and object and thereby begin to master increasingly complex communicative and co-actional sequences of interaction between partners (Bloom, 1993).

Significantly, at this point in development infants become better able to represent both the attentional focus and underlying intentions of others (Tomasello, 1995). Through interactive discourse with the older infant, the ability of both mother and infant to "mentalize" and reflect is engaged (Fonagy & Target, 1997), as is the ability to communicate understanding of one's own and others' internal state. At the same time, infant quality of attachment, and the balance between attachment and proximity seeking on the one hand, and exploration of the environment on the other, becomes established. This is thought to occur sometime between 6-months and 1-year of age (Ainsworth, Bell, & Stayton, 1971; Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1969; Cohn, Campbell, & Ross, 1992).

The outcome of well-regulated, intentional, and "attuned" (Stern, 1985a; 1985b) interactions between mother and child is often assumed to depend on such characteristics as *maternal sensitivity* and *responsiveness* (Ainsworth, Blehar, Waters, & Wall, 1978; Lamb & Easterbrooks, 1981; Sroufe, 1996; Stern, 1985). These are qualities that many interpersonal and attachment theorists associate with infant attachment security and subsequent socio-emotional development (see, for example, De Wolff & van IJzendoorn, 1997). Furthermore, these qualities have been suggested to correspond to the mother's ability to move in and out of various flexible and interpretive stances in relation to the infant's developing attentional and affective capabilities (Cassidy, 1994).

In this regard, it has been proposed that during normal interactions, responsive mothers scaffold infant attention (Bakeman & Adamson, 1984; Bruner, 1977, 1982; Pecheux, Findji, & Ruel, 1992; Saxon, Frick, & Colombo, 1997; Vygotsky, 1978), in a supportive framework that at the same time contributes to the regulation of infant affect and arousal (Rothbart, Ziaie, & O'Boyle, 1992). In turn, this scaffolding process is believed to facilitate ongoing infant regulatory behaviors (Kopp, 1982; Thompson, 1994) -- behaviors that shift from an external and joint focus to that of an internal and independent one (Diaz, Neal, & Amaya-Williams, 1990).

Although these maternal characteristics are often thought to play an important role in shaping infant social and emotional functioning, an understanding of the specific means by which they impact upon development remain unclear, as are the mechanisms by which maternal qualities such as sensitivity and responsiveness might inform emerging patterns of attachment (De Wolff & van IJzendoorn, 1997).

The present study proposed that specific maternal characteristics and styles of interaction contribute to the outcome of developmental processes, and that the specific requirements of these processes change in response both to the developing competencies of the infant and to the situational context in which they are observed. In terms of the latter point, this study concurs with Lamb et al. (1987), that an episode of dysregulation and stress reduction rather than normal interaction, per se, is the most effective forum in which to examine the impact of social expectancies on infant development.

This study was developed in an attempt to understand the contribution of maternal factors to the organization of dyadic and infant regulatory and attachment outcomes, and to investigate individual differences in the ways mothers respond to and interpret their preverbal infant's affective and communicative bids during the latter part of the infant's first year. Under conditions of a perturbed communication -- in this case the *still-face situation*, a laboratory paradigm used to assess infant reactions to maternal unresponsiveness -- the specific reparative or distress regulation techniques used by the mother upon reunion with her infant, and the overall style and quality of her responsiveness, were expected to correspond to a number of variables, including display of infant negative affect, quality of dyadic repair, and quality of later attachment.

Overview of the Chapter

This chapter examines a cross-section of literature on dyadic interaction and interactive disruption and repair, in addition to many of the developmental and maternal factors suggested to contribute to these processes. It may be noted that although there has been a good deal of research in the area of mother-infant interaction, much of it has either addressed the functioning of younger infants in

the first half year of life, or has focused on those interactions that occur in free-play or other unstructured situations. This places many of these studies beyond the scope of this paper.

Nevertheless, a brief overview of the general literature on mother-infant interaction will be presented here, along with its attendant theories. This will be followed by a review of the developmental tasks -- in a number of areas of functioning -- that confront the 10-month old infant, as well as an examination of the qualities that comprise maternal sensitivity or responsiveness, and a look at the processes that make up *interactive disruption and repair* -- that is, the state and correction of mismatch or "dyssynchrony" that occurs with the failure or discontinuity of an expectable dyadic exchange (Tronick, 1989). General concepts and definitions pertaining to the various developmental tasks and processes described will also be provided.

Mother-Infant Interaction

An increasingly common although not universally accepted view in the study of development is the premise that rather than being a matter of "nature" or "nurture," it is instead the conjoint impact of *child factors* -- such as neurological maturity or proneness to distress, and *social or environmental factors* -- such as maternal attributes of sensitivity, that act to influence the unfolding course of infant development (see, for example, Gunnar, Mangelsdorf, Larson, & Herstgaard, 1989). A conceptual model of development involving individual parts like the ones just described interacting within the context of a larger framework (Bertalanffy, 1968) finds parallels in the historical changes marking the study of mother-infant interaction and its impact upon developmental outcome.

Early in the 1970's developmental psychologists began to reconceptualize the question of infant development on the basis of mother-infant interaction and its *dyadic* properties, rather than in terms of the individual or the system's component parts (Sander, 1977, 1983, 1985). As a result of this paradigmatic shift, mothers and infants began to be seen not as isolated entities with individual behaviors, but as "research units" in which "shared organizational forms," such as *synchronous rhythms* or *affects* could be operationalized and measured (Condon & Sander, 1974b).

Much of this early research investigated the question of conversational synchrony between adult speech and infant body movements and its implications for later language development (Condon & Sander, 1974a; 1974b). Although some of these findings have since failed to be replicated (see, for example, Dowd & Tronick, 1986 and Rosenfield, 1981), they were nevertheless pivotal in terms of their impact on the empirical study of infant development.

Following these early studies, other researchers began to propose theories connecting mother-infant interaction and infant functioning and development. Of these, some suggested that interactive exchanges between mothers and infants take place within a framework of dynamic and complementary systems of ongoing mutual- and self-regulation processes (Beebe & Lachmann, 1994; Gianino & Tronick, 1988). While these regulatory processes were first thought to occur only in terms of affect and arousal, this idea was later broadened to include other systems such as attention and communication (Thompson, 1994).

Overall, these developmental theories proposed that interactive processes with the mother provide a context, structure, and meaning for the infant that -- in addition to other biological and maturational changes going on -- impact upon the

cognitive, social, emotional, and language development of the infant (Beebe & Lachmann, 1994; Gianino & Tronick, 1988; Tronick, 1989).

According to this model of development, characteristic patterns in the ways mothers and children interact influence subsequent infant expectations (Gianino & Tronick, 1988), which in turn help organize infant experience of self and other (Beebe, Lachmann & Jaffe, 1997). By achieving a state of what has alternately been called "reciprocity" (Brazelton, 1974), "synchrony" (Condon & Sander, 1974b), "attunement" (Stern, 1985a), "matching" (Tronick, Als, & Adamson, 1978) and "intersubjectivity" (Trevarthan, 1977), and by assigning meaning to the infant's activities and behaviors, the mother generates further patterns of interaction which are themselves controlled by mutual expectancies (Gianino & Tronick, 1988).

If these mutual expectancies occur in the context of positive interactions, they are thought to generate positive affect in the infant, as well as a sense of increased efficacy and agency (Beebe & Lachmann, 1988; Beebe, Lachmann & Jaffe, 1997). On the other hand, if these expectancies are violated they will produce a state of negative affect and dysregulation.

The process of mutual regulation is thought by theorists to be based on a feedback system that optimally allows for flexibility, disruption, and reorganization of its component parts (Brazelton & Als, 1979). Changes that occur in the maturing infant are seen as enhanced by the supportive and regulating interventions of the mother in interaction with the infant. This, in turn, impacts back upon the mother and upon her perception of the relationship (Brazelton & Cramer, 1990) in what has been characterized as an ongoing "bidirectional" (Bowlby, 1969; Cohn &

Tronick, 1988; Gianino & Tronick, 1988) and "goal-corrected partnership" (Bowlby, 1969).

Infants are thought to achieve a greater sense of relational predictability and security in this way, thereby enabling the development of more complex mental constructs of self and other, and "self and other in relationship" (Stern, 1983). It has been suggested that attachment security and what has been variously called "internal representations" or "internal working models" of feelings, behaviors, memories, and fantasies are shaped by this process, based upon infant expectations of the mother and of the dyadic relationship (Bretherton, 1990; Main, Kaplan, & Cassidy, 1985).

However, mothers do more than simply attune to or match their infants' behaviors, particularly in light of the infant's increasing developmental skills and capabilities. In this regard, mothers use *scaffolding* behaviors -- that is, joint activities initiated by the mother but often implemented in response to infant state or behavior -- in order to support, guide, and modify their interactive style to fit the infant's given developmental level and abilities (Bruner, 1977; Vygotsky, 1978). As a result of these activities, the infant is able to move to more self-reliant and independent functioning. The mother's provision of this structure is then gradually withdrawn as the infant acquires, internalizes, and consolidates new skills and capabilities (Diaz, Neal, Amaya-Williams, 1990).

Regulatory Processes

In the earliest months of life, interactions between mothers and infants occur primarily within the context of emotion-regulation processes involving the modulation of infant affect, state, and arousal (Kopp, 1989). Basic to this process is the premise that initial regulation of the mother-infant exchange occurs within

the context of mutual communicative acts (Tronick, 1980). Over time, the mother makes use of supportive techniques and interventions that "educate" her infant's immature regulatory system (Kopp, 1982). With repeated use of these regulated and regulating interventions, the infant internalizes the organizing experiences provided by the mother, as well as those of the dyadic interaction (Bowlby, 1969; Bretherton, 1988). In this way, self-regulation is believed to occur.

Through these regulating interactions, the infant eventually achieves a sense of competence and control over inner states of affect and arousal, and is thereby enabled to organize those "processes and characteristics involved in coping with heightened levels of positive and negative emotions including joy, pleasure, distress, anger, fear and other emotions" (Kopp, 1989, p.343). Along with this control, comes an increased confidence in the ability to tolerate, rather than be overwhelmed by or deny negative inner states (Kobak, 1985).

Developmental progress towards self-control as opposed to "other-regulation" permits a change in the kinds of behaviors and regulatory strategies used by both mother and infant (Thompson, 1994). It also provides opportunities for an increase in the number, behavioral complexity, and frequency of transitions from one strategy to another (Gianino & Tronick, 1988).

For example, while the younger infant is more likely to rely on primitive coping strategies like *gaze aversion* and *fussing* when confronted by stress, the older infant -- by about 9-months of age -- is able to use increasingly sophisticated and autonomous regulation strategies, like *self-soothing* and *self-distraction* (Gianino & Tronick, 1988; Mangelsdorf, Shapiro, & Marzolf, 1995). Also by about 9-months of age, there is a greater likelihood that the infant will become positive first, thus eliciting a state of coaction by the mother. In this regard, it has

been noted that most mothers remain in a state of joint positive interaction until the infant terminates the exchange by becoming either neutral or disengaged (Cohn & Tronick, 1987).

In regard to maternal contributions to this process, mothers have been shown to encourage and sustain positively-toned interactions with their infants, with *their* positivity generating similar affect in the infant (Beebe & Lachmann, 1988). Infant display of negative affect -- in this case, distress, anger, or sadness -- is suggested to indicate a responsive signal to the mother to change her behavior and to reinstate a more positive, expectable interaction (Gianino & Tronick, 1988). Thus, the infant's experiences of negative affect may be associated with the mother's competent responsiveness in interactions that further enhance regulatory and developmental growth (Lamb & Easterbrooks, 1981).

Furthermore, maternal sensitivity to infant capacity for engagement, attention, and need for withdrawal may reinforce positive interactions with the mother and through these interactions simultaneously ensure a state of *attention homeostatis*. Attention homeostatis, a mechanism proposed by Brazelton et al. (1975), is thought to prevent the infant's neurophysiological system from being stressed or overwhelmed.

In addition to other conceptualizations in this regard, infant experiences of social expectancy, trust, and self-effectance have been suggested to develop in the course of maternal emotion regulation and distress-relief sequences (see Lamb & Malkin, 1986). Consistent with this position, the skillful application of such appropriate, supportive, and empathic interventions and the competent use of distress management techniques have been found to facilitate self-regulation processes in infants (DelCarmen, Pedersen, Huffman, & Bryan, 1993).

The use of such techniques has also been reported to predict later attachment security in infants (DelCarmen, Pedersen, Huffman, & Bryan, 1993), and the successful implementation of techniques like *soothing* or *rocking* have been found to increase the experiential sense of maternal -- in addition to infant -- self-efficacy and competence (Donovan & Levitt, 1989).

Attentional Processes

If the initial half of the infant's first year is primarily concerned with the organization of affect and arousal, as well as with the modulation of physiological, behavioral and sensory systems (Kopp, 1982), the second half of that year is given over to the refinement of these processes and to the development of other complex skills and attainments. For example, some developmental theorists see reciprocity in joint engagement and attention as "the developmentally advanced analogue to mutual regulation of affective expression in earlier face-to-face mother-infant play" (Raver & Leadbeater, 1995, p. 252). Others view maternal scaffolding of infant attention as central to the process of communicative functioning (Adamson, 1995; Bruner, 1982).

Prior to this time, infants and mothers have been engaged in efforts to control those experiences relating to basic affect and arousal (Kopp, 1989). With greater self-regulation and the modulation and integration of physiological, behavioral, and sensory systems, this focus radically changes (Bertenthal & Campos, 1987; Kopp, 1982). Consequently, additional capabilities in the areas of attention (Ruff & Rothbart, 1996); language (Bloom, 1993; Bruner, 1983); and

sensory-motor systems (Campos & Bertenthal, 1989; Simion & Butterworth, 1998) allow the older infant more flexibility and control in a wider range of situations.

Some theorists have argued that the neural development of the infant's attentional system depends in part on the capacity to organize and integrate multimodal sensory information (Bertenthal & Campos, 1987). Others have proposed that developmental changes in neural systems involving *attention regulation*, rather than *emotion regulation*, per se, may account for the older infant's greater capacity to ameliorate negative affect and distress (Rothbart, Posner, & Boylan, 1990; Rothbart, Ziaie, & O'Boyle, 1992).

In terms of the development of specific attentional processes, it has been demonstrated that levels of sustained attention increase during the infant's first year (Ruff, 1990). Studies have found that by 6-months of age infants are able to attend to objects and to look where others look; by 9-months of age, they have the additional ability to alternate looks between objects and people (Scaife & Bruner, 1975). As they develop, infants display increased orientation towards their mothers (Rothbart, Ziaie, & O'Boyle, 1992). On the other hand, when attending to objects, they spend longer periods of time looking at them than do their younger counterparts (Pecheux, Findji, & Ruel, 1992). Infants are also able to use objects in increasingly self-regulating ways -- for instance, as *distractions* (Gunnar, Mangelsdor, Larson, & Herstgaard, 1989).

Those processes involved in *maternal scaffolding* of infant attention have been reported to develop sometime in the middle of the infant's first year (Bakeman & Adamson, 1984; Bruner, 1982; Pecheux, Findi, & Ruel, 1992). A

connection has been made between maternal mobilization of attention at 5-months of age and the amount of infant focused attention at 8-months of age, although the use of maternal scaffolding itself has been shown to decrease with age (Pecheux, Findji, & Ruel, 1992).

Moreover, those attentional strategies used by the mother to meet the developing cognitive and emotional needs of the infant appear to change. For example, as the infant's physiological system matures, the mother relies on such strategies as *distraction* and *redirection of attention*, in order to facilitate communication and regulate affect and arousal (Thompson, 1994). The amount of time spent in joint engagement has been reported to increase between 6- and 8-months of age, although in one study at least, mothers spent *less* of that time engaged in activities like *redirecting* infant attention (Saxon, Frick, & Colombo, 1997).

It has been proposed that the ability of infants to alternate looks between objects and people, which occurs by about 9-months of age, allows for the emergence of both *secondary intersubjectivity* -- that is, the ability to attend to and acknowledge both person and object (Trevarthen & Hubley, 1978), and *joint attention*, or the ability to mutually focus with a partner on an object or event (Adamson, 1995; Adamson & Bakeman, 1991; Tomasello & Todd, 1983; Bretherton & Bates, 1979).

Joint attention is thought to develop sometime in the latter part of the infant's first year (Corkum & Moore, 1995; Tomasello, 1995), a time when infants are better able to understand and represent the attentional focus and intentional stance of others (Tomasello, 1995). In addition to other functions, joint attention has been suggested to involve and utilize components of *reference sharing* -- that

is, the use of "protodeclarative" communications or gestures thought to precede the emergence of formal verbal language, such as *giving*, *showing*, *pointing* and *requesting* (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979).

These behaviors may be used by the infant in order to elicit adult affective or social responses (Moore & Corkum, 1994). They may also serve to direct attention to objects or events (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979). In this case as well, the duration of specific joint attentional episodes have been noted to increase with age (Adamson & Bakeman, 1985; Bakeman & Adamson, 1984).

The organization of infant attentional and affective regulatory systems has been reported to have a well-established neurobiological base, achievements that translate into greater freedom for the infant in terms of physical and social opportunities -- activities that in turn facilitate additional neural and cognitive growth (Schoore, 1994). With greater neurophysiological maturity, these maternal behaviors and joint interactive processes are believed to reinforce infant use of language as a social and communicative tool (Bruner, 1982).

Language and Communicative Processes

The previous discussion presented evidence that as the infant develops, both maternal and infant roles and abilities begin to shift. For her part, the mother continues to modulate and guide infant affect, attention, and arousal (Beebe & Lachmann, 1988). However, she may now vary the use of supportive behaviors or use new strategies with which to encourage the infant's emerging social, language, and communicative skills (Rome-Flanders, Cronk, & Gourde, 1995). For the

infant's part, the last quarter of the first year is marked by other important changes and acquisitions, as well.

For example, the infant is now viewed as a more effective dialogic partner, displaying complex social and communicative behaviors, such as turn-taking and the sharing of common vocal codes, feeling states, and topics. In part, these characteristics have been suggested to be a consequence of the infant's experience of shared communicative, and joint attentional, interaction (Adamson, 1995; Papousek, 1995).

It has been demonstrated that by the end of the first year infants begin to display an increased ability to produce active, coherent, and subtle communicative bids to others (Bruner, 1982). Specifically, they are now capable of engaging in more complex linguistic and social interactions and communications (Bloom, 1993) and have usually mastered those skills required for understanding reciprocity and *intentionality* -- that is, the beginning awareness of internal states, goals, or plans and their effects upon the environment (Adamson, 1995; Bretherton & Bates, 1979; Schaffer, 1989). It has also been suggested that infants have achieved additional capabilities at this point in development as well, such as the internalization of speech (Vygotsky, 1981).

Shared or joint attentional processes have been hypothesized to play an important role in supporting language skills and development. For example, joint attention has been found to facilitate lexical, conversational, and syntactic language abilities in infants (Tomasello, 1988), and to have a positive impact on early vocabulary development (Akhtar, Dunham, & Dunham, 1989; Tomasello & Farrar, 1986). On the other hand, it has been demonstrated that maternal activities such as *following* and *sharing* infant focus of attention are more important to the

development of language competence than are the structure and pragmatic intent of the mother's utterances (Akhtar, Dunham, & Dunham, 1991).

The period representing transition to symbolic language and speech production, beginning at about 10- or 11-months of age, has been described by one researcher as potentially "more promising" than the first 6 months for finding significant links between social interaction and communicative development (Golinkoff, 1983). During or just preceding this point in development, other key social and emotional processes are also taking place.

Attachment Processes

It has been noted that infants move towards the latter part of the first year with greater behavioral inhibition and a sensitivity to positive and negative signals from the environment; they also evidence an increased fear of novelty, including a wariness of strangers, and a greater reliance on caregiver availability (Rothbart & Posner, 1985). Attachment processes and the balance between attachment and proximity seeking on the one hand, and exploration of the environment on the other, are thought to become organized sometime after about 6-months of age (Ainsworth, Bell, & Stayton, 1971; Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1969; Cohn, Campbell, & Ross, 1992).

Early attachment theorists have proposed that the foundation for attachment organization may be the bidirectional, goal-corrected partnership between mother and child (Ainsworth, Bell, & Stayton, 1974; Bowlby, 1969, 1973, 1980). Quality of attachment is most frequently viewed as part of the affectional relationship between mother and infant, centering around those aspects of the relationship that involve proximity-seeking, felt security in terms of maternal

availability, and the experience of distress, grief, and anger upon separation and loss (Bowlby, 1969, 1973; 1980).

While a secure attachment has been characterized as a state of balance between attachment, proximity seeking, and independent exploration (Ainsworth, Bell & Stayton, 1971), other distinctions between attachment processes have been made. For example, a differentiation has been proposed between attachment behaviors, attachment behavioral systems, and attachment bonds (Ainsworth, 1973; Belsky & Cassidy, 1994; Bowlby, 1982; Hinde, 1982). In this regard, an *attachment behavior* is a situational activity that promotes proximity to the caregiver; an *attachment behavioral system* is the organization of exploratory and proximity-seeking attachment behaviors; and an *attachment bond* is the affectional tie between two individuals, one being older and wiser, such as a parent (Belsky & Cassidy, 1994).

Individual differences in attachment relationships were first observed empirically with the Strange Situation, a laboratory paradigm considered to be a reliable method of assessing mother-infant attachment security (Ainsworth, Bell & Stayton, 1971; Ainsworth, Blehar, Waters, & Wall, 1978). This measure, which consists of eight discrete episodes, was originally created by Ainsworth & Wittig (1969) in order to examine infant exploration in the presence and absence of the mother. It was later found that the reunion behaviors following periodic separations from the mother offered the most revealing differences between infants (Ainsworth, Bell, & Stayton, 1971).

According to behaviors measured during these reunion episodes, infants are classified according to three patterns of attachment -- (A) insecure-avoidant; (B) secure; and (C) insecure-resistant. A fourth category, (D) insecure-disorganized

attachment, was later added to the classification system (Main & Solomon, 1987), although it is not consistently used across attachment studies.

In terms of the behavioral differences elicited by the Strange Situation, it has been observed that securely-attached or *secure* (B) infants use the mother as a secure and safe base from which to explore the environment (Ainsworth, Blehar, Waters, & Wall, 1978). Although they may be increasingly upset or distressed by her absence, these infants greet the mother positively upon her return or are able to be comforted by her so that positive interactions and exploratory play may be resumed. In normative samples, securely-attached infants represent approximately 66% of the population (van IJzendoorn & Kroonenberg, 1988).

On the other hand, anxiously-attached *avoidant* (A) infants have been observed to play more autonomously than secure infants and appear more disinterested in the mother's presence or absence; these infants ignore or avoid the mother upon her return. Anxiously-attached *resistant* (C) infants have been reported to be overly-concerned about the mother's whereabouts and to become highly distressed by her absence; these infants exhibit ambivalent, approach-avoid behaviors upon the mother's return and are not easily soothed or comforted by her (Belsky & Cassidy, 1994). In normative samples, insecurely-attached avoidant and insecurely-attached resistant infants represent about 20% and 14% of the population, respectively (van IJzendoorn & Kroonenberg, 1988).

Maternal Sensitivity

Maternal characteristics, such as those involving sensitivity or responsiveness, have been suggested by many attachment theorists to impact upon infant development and upon the organization of attachment security (see, for example, Ainsworth, Bell, & Stayton, 1974; Ainsworth, Blehar, Waters, & Wall,

1978; Belsky & Isabella, 1988; Belsky, Rovine & Taylor, 1984; Bowlby, 1969; Bretherton, 1985; Egeland & Farber, 1984; Isabella, 1993; Lamb & Easterbrooks, 1981; Main, 1990; Sroufe, 1988). However, this is not an undisputed finding (see De Wolff & van IJzendoorn, 1997, for a review of this debate).

Differences in the criteria used to measure maternal sensitive behaviors may account for some of these discrepancies in research findings (De Wolff & van IJzendoorn, 1997). On this point, Leyendecker et al. (1997), in a study of playful interactions and attachment, offered guidelines with which to conceptualize the study of maternal sensitive responsiveness. These authors have distinguished two separate maternal constructs -- that is, sensitive responsiveness and responsivity, noting that "*sensitive responsiveness* is operationally and conceptually defined by an adult's tendency to provide contingent, appropriate, and consistent responses to the infant's signals or needs, whereas *responsivity* refers to the likelihood of an adult's responses to infant signals, regardless of their appropriateness " (p.25).

Questions about maternal sensitivity have also been raised by theorists in other areas of infant development, as well. For example, researchers in the field of language acquisition have examined whether behaviors such as *maternal directiveness* necessarily convey a quality of maternal "insensitivity" (Girolametto, 1995; Pine, 1992). In addition to raising questions about whether *maternal sensitivity* is a unified construct, Pine (1992) and others have concluded that maternal sensitivity, in general, may encompass other behaviors than empathic or mirroring ones.

The specific means and measure of maternal sensitivity or responsiveness may play an important role in this regard, as well. For example, a negative relationship has been found between *moderate* levels of attentional and affective

engagement -- consistent with more responsive mothering -- and later behavioral and regulatory disorders in childhood (Cohn & Tronick, 1989). On the other hand, *high* or *low* levels of engagement, characteristic of more "intrusive" or "withdrawn" mothers, respectively, have been found to place infants at higher risk for subsequent dysregulation and other emotional and behavioral disorders.

By the same token, *mid-range* rather than *high* or *low* levels of maternal vocal stimulation have been described as "optimal" for infant socio-emotional development and secure attachment (Beebe, 1992). One study found that *hyper-responsivity*, which tends to divert infant attention away from independent exploration and toward the parent, is as "insensitive" a type of parenting as is *hypo-responsivity* (Cassidy & Berlin, 1994). This is in contrast to *intermediate* levels of responsiveness, which have been shown to increase self-reliance and self-regulation (Malatesta, Culver, Tesman, & Shepard, 1989; van den Boom, 1994).

The construct of *maternal sensitivity* or *sensitive responsiveness* has historically been understood to be the "degree of sensitivity the mother shows in perceiving and responding promptly and appropriately to the infant's signals and communications" (Ainsworth, Bell, & Stayton, 1974, p. 107). Ainsworth and her colleagues additionally note that sensitive responsiveness to infant signals and communications is "the most important aspect of maternal behavior commonly associated with the security-anxiety dimension of infant attachment" (Ainsworth et al., 1978, p. 152).

Among other criteria, responsive mothers are thought to create *facilitating environments* (Winnicott, 1965) for their infants, and have been observed to be more "emotionally flexible" and accepting of positive and negative emotions in both themselves and their infants (Cassidy, 1994; Bretherton, 1990).

Of those studies that have proposed an association between maternal characteristics and attachment behaviors, the following distinctions have been made: Mothers of infants later classified as securely attached (B infants) have been described as more sensitive, accepting, and expressive of affect than mothers of insecurely attached infants (Ainsworth, Blehar, Waters, & Wall, 1978; Goldberg, MacKay-Soroka, & Rochester, 1994; Main, Tolan, & Tomasini, 1979).

In contrast, mothers of resistant (C) infants have been determined to be more underinvolved and less likely to respond consistently and contingently to infant signals and cues (Ainsworth, 1984; Cassidy & Berlin, 1994), although they are said to be more responsive to negative than to positive affect (Goldberg, MacKay-Soroka, & Rochester, 1994). Mothers of avoidant (A) infants have been reported to be more interfering, overstimulating, inexpressive, and rejecting of infant signals and cues (Ainsworth, 1984; Isabella, 1993; Main, 1981), *particularly* those involving affect states (Goldberg, MacKay-Soroka, & Rochester, 1994). Mothers of disorganized (D) infants, having experienced unresolved loss, are thought to be largely uninvolved, depressed, abusive, and rejecting of many of their infant's communications (Lyons-Ruth, Repacholi, McLeod, & Silva, 1992).

Another line of research examining the relationship between maternal attributes and attachment outcomes is the study of adult attachment and the intergenerational transmission of attachment patterns (see, for example, Benoit & Parker, 1994; Fonagy, Steele, & Steele, 1991; Slade, 1999). For example, one study reported that secure mothers soothe their infants with a combination of mirroring or containing functions and displays *unlike* the child's affect (Fonagy & Target, 1997). In this case, insecure mothers were found to reinforce infant identification with "defensive" -- in other words, dismissive or withdrawn --

behaviors and experiences. In the insecure conditions, the infants' experiences of self were hypothesized to exist in a state of "dyssynchrony" (Biringen, Emde, Pipp-Siegel, 1997; Crittenden, 1994), which in turn has been theorized to lead to later psychopathology (Fonagy, Steele, Steele, Leigh, Kennedy, Mattoon, & Target, 1995; Schore, 1994).

Some of these studies of attachment transmission have found links between attachment on the one hand, and maternal coherence and metacognitive processing on the other (Main, 1991), as well as between attachment and *reflective functioning* in parent and child -- that is, the ability to communicate understanding of one's own or another's mental state and intentional stance (Fonagy, Steele, Steele, Leigh, Kennedy, Mattoon, & Target, 1995; Fonagy & Target, 1997).

Additional support for a connection between maternal characteristics and attachment outcome has come from studies involving maternal deprivation (see, for example, Bowlby, 1969, 1973; Spitz, 1965) and international orphanages and adoptions. Many of these latter studies have reported greater regulatory, attachment, and behavioral disorders among children who lacked responsive mothering in infancy (Chisholm, Carter, Ames, & Morison, 1995; Groze & Rosenthal, 1993; Marcovitch, Goldberg, Gold, Washington, et al., 1997). In at least one of these studies, it was noted that the greatest attachment problems occurred in infants adopted *after* the age of 4 months (Chisholm, Carter, Ames, & Morison, 1995) -- that is, *before* the organization of attachment processes and more complex patterns of social and emotional interaction.

Maternal sensitivity or responsiveness to infant signals and cues has been suggested to facilitate a *positive* quality of interaction occurring in the context of shared affective, communicative, and attentional processes. These processes are

thought to further impact upon maternal, infant, and interactive behaviors in a corrective system that includes expectable disruptions and repairs.

Dyadic Disruption and Repair

The bulk of research on *interactive disruption and repair* has been organized around the model of mutual regulation of mother-infant interaction, with an emphasis upon the infant's ability to cope with interactive stress (Cohn & Tronick, 1983, 1987; Gianino & Tronick, 1988; Tronick, Als, Adamson, Wise, & Brazelton 1978; Tronick, Als, & Brazelton, 1980; Tronick & Cohn, 1989; Tronick & Gianino, 1986; Tronick, Ricks, & Cohn, 1982). In this regard, it has been shown that, rather than revealing smooth and harmonious exchanges, most normal mother-infant interactions are characterized by a high level of inter-partner errors and mismatches (Beebe & Lachmann, 1994; Gianino & Tronick, 1988; Tronick & Gianino, 1986).

For example, in one study measuring dyadic synchronicity, reciprocity, matching, coherence, and attunement in mother-infant pairs it was found that mismatches between mother and infant occurred approximately 70% of the time. These states were then repaired with such coping strategies as *self-comfort* and *gaze aversion* (Tronick & Gianino, 1986). In another study, this in the area of language development, it was reported that mothers failed to understand their infant's goals in about 50% of the communications the infants initiated (Golinkoff, 1986).

As a rule, many of these mismatches in mother-infant communication have been conceptualized in terms of their ability to motivate infants to adjust to their mothers or to modify the exchange in some way with the use of their own interactive skills -- something that becomes increasingly possible over the course of

the first year given the infant's expanding repertoire of communicative strategies (Tronick & Gianino, 1986)

Developmentally, the tendency towards normal disruptions has been noted to decrease over the infant's first year, although it has been observed to occur after this time (Adamson & Bakeman, 1991). A number of researchers have suggested that a clearer understanding of the process of mismatch and repair could help provide greater knowledge about the development of the dyadic interactional system and about how the framework for shared attention and interaction is established (Adamson & Bakeman, 1991; Golinkoff & Gordon, 1988; Tronick & Cohn, 1989).

Early developmental and cognitive theorists, such as Piaget and Vygotsky, stressed that the experience of failure or conflict may serve as a mechanism with which to "spur" development (Golinkoff, 1983). Other theorists have observed that the basis of communicative understanding is rooted in the preverbal period when the infant is learning to "negotiate meaning in the face of failure" (Golinkoff, 1986, p. 474).

The most commonly used method of studying empirically the processes and effects of interactive disruption and repair is a perturbation of normal mother-infant interaction such as an episode of *maternal unresponsiveness*. The most frequently used of these perturbations is the laboratory *still-face situation* (see, for example, Carter & Mayes, 1990; Carter, Mayes, & Pajer, 1990; Cohn, Campbell, & Ross, 1991; Cohn & Tronick, 1983; Gusella, Muir, & Tronick, 1988; Field, 1994; Field, Vega-Lahr, Scafidi, & Goldstein, 1986; Mayes & Carter, 1990; Stack & Muir, 1990; Toda & Fogel, 1993; Tronick, Als, Adamson, Wise, & Brazelton, 1978; Weinberg & Tronick, 1994).

Still-Face Situation

The still-face situation is a laboratory perturbation of normal mother-infant interaction considered to be a reliable method of measuring infant reactions to interactive stress. The measure was created by Tronick and his colleagues (Tronick, Als, Adamson, Wise, & Brazelton, 1978) at the Boston Children's Hospital in order to assess the effects of maternal withdrawal and subsequent unresponsiveness on the coping and regulatory abilities of young infants (Cohn & Tronick, 1983; Tronick, Als, Adamson, Wise, & Brazelton, 1978; see also Field, Vega-Lahr, Scafidi, & Goldstein, 1986; Fogel, 1982).

It has been suggested that response to the still-face situation "assesses the infant's relationship history with the mother" (Cohn, Campbell, & Ross, 1991, p. 368). The procedure has since been found to have greater negative effects on infant interactive behavior than does a brief maternal separation (Field, Vega-Lahr, Scafidi, & Goldstein, 1986).

For the most part, the still-face situation has been used to study the coping responses of younger infants -- that is, in those children between the ages of 2- and 6-months of age (see, for example, Cohn & Tronick, 1983; Fogel, Diamond, Langhorst, & Demos, 1982; Gusella, Muir, & Tronick, 1988; Mayes & Carter, 1990; Toda & Fogel, 1993). A few studies have looked at the still face in infants up to the age of 9 months (for example, Cohn, Campbell, & Ross, 1991; Cohn & Tronick, 1987; Tronick, Ricks, & Cohn, 1982). None have looked at infant responses in older infants -- that is, in infants over the age of 9 months.

The still-face procedure consists of three brief episodes of interaction. These episodes are videotaped through a one-way mirror and include 2-minutes of normal *face-to-face interaction*, 2-minutes of *maternal still face* -- where the mother assumes an affectively neutral expression, and 2-minutes of *reunion* or

resumption of interaction. During the assessment, the infant sits opposite the mother in a high-chair; no toys or other objects are available to either participant. The mother is asked to interact normally in the first and third sequences, and is instructed not to talk, smile, or touch the infant during the still-face sequence. The episodes are separated by short intervals during which time the mother turns away.

Infant Variables

Historically, most still-face studies measuring the effects of maternal unresponsiveness on infant behavior have focused exclusively on the second, *still-face* episode of the procedure, where maternal behaviors are held constant. This presupposes a focus on infant variables which, in the majority of cases, have been conceptualized in terms of infant coping responses to stress (see, for example, Cohn & Tronick, 1983; Field, Vega-Lahr, Scafidi, & Goldstein, 1986; Fogel, 1982; Tronick, Als, Adamson, Wise, & Brazelton, 1978).

In terms of infant variables, infant behavior in response to the maternal still face has been reported to be well organized by about 6-months of age (Tronick, Ricks, & Cohn, 1982; Weinberg & Tronick, 1994). Generally, three patterns of infant responses have been identified -- positive elicits, negative elicits, and no elicits (Tronick, Ricks & Cohn, 1982). In the *positive elicit* pattern, the infant smiles, vocalizes or otherwise attempts to elicit a reaction from the mother. Although positive elicits may be interspersed with such behaviors as *sobering*, *averting gaze* or even *crying*, it is clear that a positive engagement characterizes the overall interaction. In the *negative elicit* pattern, the infant fusses, cries and makes no attempt at engagement. In the *no elicit* pattern, the infant looks towards and away from the mother, seeming tense and distressed, and makes no attempt at interaction.

Infant behaviors and emotional expressions elicited during the still face have been characterized to a large extent by *neutral affect* and *gaze aversion* (Mayes & Carter, 1990), a decrease in *gaze/smile* and, in many cases, an increase in *grimace* (Toda & Fogel, 1993). However, many young infants, even when averting gaze, have been found unable to completely disengage from their mothers. In these cases, there is frequently an increase in self-regulating behaviors, such as *self-comforting* and *external object focus* (Gianino, 1985). *Protest* or other displays of negative affect tend to increase once the interaction is resumed (Fogel, 1982).

For the most part, infants who experience more interactive repairs during normal interaction -- in the form of transformations from negative to positive affect -- are also more likely to try to re-engage their mothers during the still face (Gianino & Tronick, 1988). These infants are believed to have internalized representations of potentially reliable caregivers and reparable interactions, using themselves as agents of the repair (Tronick, 1989).

On the other hand, infants who experience fewer repairs during interaction are less likely to solicit maternal attention during the still face, instead tending to turn away or to become distressed. Infants who experience chronic levels of miscoordination or failures to repair during interaction tend to exhibit the greatest degree of negative affect or disengagement (Gianino & Tronick, 1988). These infants are assumed to have developed representations of their mothers as unreliable partners, and/or of themselves as ineffectual agents of change (Tronick, 1989).

Only a few studies have investigated the connection between infant behaviors, as measured during the still-face situation, and later behavioral

outcomes (see, for example, Cohn, Campbell, & Ross 1991 and Tronick, Ricks, & Cohn, 1982). In one case, an association was found between infant ability to cope with interpersonal stress at 6-months of age and interpersonal competence at 1-year of age (Gianino & Tronick, 1988).

Other studies have reported links between still face behavior and later attachment security. For example, one study found that infants who *positively elicited* maternal attention in light of the still face at 6-months of age were more likely to be securely attached at 1 year (Tronick, Ricks, & Cohn, 1982). Another study demonstrated that while *positive* expressions in response to the still face at 6-months of age predicted secure attachment at 1 year, the absence of these expressions was related to subsequent *avoidant* attachment (Cohn, Campbell, & Ross, 1991). In the latter study, the authors concluded that variables associated with temperament, such as sociability and proneness to distress, were unrelated to attachment status.

Maternal Variables

Since maternal behaviors are held constant during the 2-minute still-face episode of the still-face procedure, gathering information about maternal variables or their effects on infant behavior necessitates one of two approaches. The first approach requires the assessment of maternal behaviors or characteristics during normal interaction -- that is, during the initial interaction prior to, or the resumption of interaction following, the still face. The second approach involves the investigation of the mother's recollections of the still face experience itself. Few studies in the literature have addressed these issues thusfar.

Of those that have, one study found that mothers who *elaborated* infant behaviors sensitively and responsively at 6-months of age, and who were neither

under- nor *over-controlling* during normal interaction prior to the still face, had infants who used a more varied and positive repertoire of coping strategies during the still face (Tronick, Ricks, & Cohn, 1982). A second study reported that the display of maternal *positive affect* during normal interaction with 3- to 4-month olds was correlated with infant *social gaze*, although not infant *affect*, during the still face (Carter, Mayes, & Pajer, 1990).

A third study looked at the relation between maternal *emotional availability*, as measured during the initial interaction prior to the still face, and infant affect regulation, as measured during the reunion or re-engagement episode following it (Kogan & Carter, 1996). In this study, reunion or re-engagement behaviors were rated according to the same classification system as was used in the Strange Situation (Ainsworth, Blehar, Waters, & Wall, 1978) -- that is, the classification of secure, avoidant, or resistant attachment based on behaviors manifested after a brief separation from the mother.

The results of this study revealed that mothers of 4-month olds actively supported their infant's abilities to regulate emotion, and that a higher level of maternal emotional availability prior to the still face was associated with smoother, more well-regulated interactions following the still face (Kogan & Carter, 1996).

Specifically, it was reported that mothers who were judged *sensitive* during the initial interaction, as opposed to *intrusive* or *hostile*, had better-regulated reunions with their infants. This is in contrast to mothers who exhibited lower levels of emotional availability. Infants of these mothers displayed more insecure attachment behaviors, as characterized by greater amounts of *avoidance* or *resistance*. Kogan & Carter (1996) also noted that in 4-month olds at least,

negative affect carried across episodes -- that is, infants who displayed more negative affect during normal interactions were more negative during the still face, and those who were more negative during the still face were more negative upon reunion.

In a different approach to the study of maternal variables using the still-face procedure, Mayes, Carter, Egger, & Pajer (1991) examined mothers' subjective experience of the still-face situation with their 3-month old infants. Through observation and questioning, the authors found that almost 60% of the mothers studied experienced some anxiety and discomfort during the still face. Moreover, discomfort levels tended to be higher if the child protested the mother's unavailability. An additional 16% of these mothers were aware of the condition of *potential* stress and discomfort. Those who experienced the greatest discomfort were also more likely to have infants who exhibited more negative affect during the still face.

This study reported that after normal interaction resumed, almost all of the mothers verbally announced their return to an interactive state, and 68% of them displayed notable or exaggerated positive affect upon re-engagement. Those mothers who experienced the increased discomfort were more likely to mark their return to interaction with soothing comments or remarks about their feelings. They were also more likely to pick up their infants after the procedure had ended and to continue reflecting verbally upon their feelings.

On the other hand, those mothers who did not experience or report discomfort during the procedure were more likely to announce that they were back or to ask for a response from their infant. Unfortunately, although it may have

provided important insights into the nature and quality of their relationships, attachment information on the part of mother or child was not obtained.

Reunion Behaviors

A number of studies have noted a *carry-over effect* of negative affect -- that is, a continued display of infant negative affect and distress following the still face (see, for example, Carter, Mayes, & Pajer, 1990; Cohn & Tronick, 1983; Field, 1984; Field, Vega-Lahr, Scafidi, & Goldstein, 1986; Fogel, Diamond, Langhorst, & Demos, 1981; Kogan & Carter, 1996; Toda & Fogel, 1992; Tronick, Als, Adamson, Wise, & Brazelton, 1978). However, there has been little formal research investigating this characteristic reunion behavior. In addition to the studies mentioned above, only one other study has formally addressed this omission.

This study, by Weinberg & Tronick (1996), focused primarily on the affective, behavioral, and physiologic reactions of 6-month old infants to the resumption of normal interaction following the still face. These authors found that infants reacted to the resumption of interaction with a mixture of negative and positive affect.

Moreover, there was an expected *carry-over* of negative affect from the still face to the reunion episode of the procedure that manifested itself in terms of increased *fussing* and *crying*, although the infants' physiologic systems -- that is, their heart rate and vagal tone -- returned to normal levels. A rebound of positive affect was also noted during this period. The authors hypothesized that the expression of negative affect might underscore a more complex behavioral-physiological-psychological effect upon the infant than had originally been

considered. However, they did not offer more specific interpretations of these findings.

Summary of Review

This chapter explored the potential impact of maternal and infant factors on infant functioning and development, and looked at those processes of dyadic interaction, disruption, and repair that normally occur in the context of mother-infant interaction and ongoing mutual- and self-regulation. Innate maturational and developmental attainments were suggested to play an important role in the conceptualization of these processes, with the mother serving as a support and adjunct to these factors.

In this regard, the role of maternal scaffolding and maternal sensitive responsiveness and their impact upon infant development were reviewed. These factors were regarded as critical to the development of future infant socio-emotional functioning.

The beginning half of the infant's first year was viewed as involving basic regulation of affect and arousal, as well as the modulation and integration of the infant's physiological, behavioral, and sensory systems. The second half of that year was seen as concerned with additional processes of attention regulation and the consolidation of attachment organization, as well as with the infant's emerging language and communicative capabilities, including the development of intentional communication, intersubjectivity, and shared or joint attention.

A review of the laboratory paradigm most often used to measure the effects of maternal unresponsiveness on infant behavior, the still-face situation, was presented, as was a description of the specific infant and maternal variables that have been assessed using this paradigm. A presentation of the differences between

the three episodes of the still-face situation -- that is, normal interaction, still face, and reunion or resumption of interaction -- was provided, as were findings associated with the *carry-over effect* of negative affect during the reunion episode of the still-face procedure.

Research Aims

The primary goal of the present study was to examine how mother-infant pairs negotiate the process of disruption and repair following an episode of interactive stress -- in this case the still-face situation -- at 10-months of age, an older age group than has previously been reported in the literature. It was assumed, *a priori*, that the ways in which mothers respond to infant signals and cues affect ongoing regulation and organization of infant behaviors (Hayes, 1984). Moreover, an episode of distress-reduction, rather than normal interaction, was believed to be best place to obtain information about infant affect and attention, as well as about the impact of processes like social expectancies on infant development (Lamb, Morrison, & Malkin, 1987). Few studies have addressed these issues thusfar.

The present study attempted to provide a clearer understanding of the association, if any, between the interactional styles and types of strategies mothers use to re-engage their infants after an episode of interactive stress and subsequent infant regulatory and attachment behavior.

Focusing on specific developmental and situational factors, the present study proposed to address the following research questions: Is there a *carry-over effect* of negative affect following the still face? Is there a relation between the strategies mothers use to re-engage their 10-month old infants following the still face and

their infant's affect state? Specifically, do different types of maternal responses generate different levels of infant negative affect and latency to interactive repair? Interactive repair in this case was considered latency to neutral or positive affect in the context of a shared interactional state; and, Are the strategies mothers use to mediate dyadic disruption at 10-months of age related to infant security of attachment at 14-months of age? An additional inquiry was later conducted in order to examine the potential links between dyadic repair outcomes at 10-months of age and attachment outcomes at 14-months of age.

It was predicted that older infants, like their younger counterparts, would exhibit some degree of negative affect following the still face. However, given the communicative and social abilities of the older infant, these displays were understood to be both expressions of emotion (Golinkoff, 1986), and intentional communications underlying language development (Pine, 1992). Furthermore, these negative displays were hypothesized to correspond both to the specific attentional capabilities of the older infant and to the strategies mothers used to re-engage them.

In the context of a brief stressful situation it was hypothesized that mothers of 10-month olds who used more "appropriate" affect- and attention-regulating strategies would have more successfully negotiated interaction or repair outcomes, as manifested by the amelioration of infant negative affect, distress, or aversion to interaction. Dyads with these outcomes were suggested to have mothers who were neither over-identified with, nor detached from, their infant's affective experience. Rather, these mothers were thought to be able to effectively impute intentional states to themselves and others and to contain and deflect their own and

others' negative affect. Over time, such regulating efforts were presumed to relate to increased autonomy and security of attachment in these infants.

On the other hand, mothers who used less "appropriate" affect- and attention-regulating strategies following an episode of interactive stress were hypothesized to have poorer repair or recovery outcomes, as manifested by the continued display of negative affect, distress, or aversion to interaction. Dyads with these outcomes were suggested to have less effective mothers who were either unable to modulate negative affect on the one hand, or who disavowed it on the other. Over time, reliance on such strategies was expected to be associated with greater insecurity of attachment in these infants.

CHAPTER 2

METHODS

Subjects

Thirty-five primiparous mothers between the ages of 25 and 40 and their infants participated in the study. Subjects were predominantly white (94%), middle class, and highly-educated women who were recruited from childbirth classes, flyers, and newspaper advertisements in the New York City area. The mothers in the study were part of a larger longitudinal study evaluating pregnancy and the mother-child relationship through the child's third year. Consisting of a number of interviews, play sessions, and highly-structured laboratory procedures, the Pregnancy Project study was funded by the National Institute of Mental Health & Human Development, under the direction of Arietta Slade, Ph.D. All data from the Pregnancy Project was collected by graduate students in clinical psychology at The City College of New York. The subjects received \$20 for each visit.

Data for the present study was drawn from videotapes of mothers and their 10-month old infants during a standard laboratory still-face procedure, as developed by Tronick et al., 1978. Additional data was drawn four months later from videotapes of these mothers and their 14-month old infants during a standard Strange Situation procedure, as developed by Ainsworth & Wittig, 1969.

Subjects included in the study were selected based upon both the availability and the quality of their 10- and 14-month videotapes. No other criteria influenced subject selection. All behaviors assessed in the paradigms were coded by raters trained in the procedures and blind to the hypotheses of the study. Any minor audio-visual problems or questions were discussed and resolved prior to resumption of coding procedures.

Procedure

Both the 10-month still-face procedure and the 14-month Strange Situation took place in the Infancy Lab at The City University of New York. In terms of the still-face procedure, the mother was videotaped through a one-way mirror with researchers timing separate segments of the paradigm. Time was indicated and recorded by a digital clock on the video display. The room in which the procedure took place was empty except for a chair, a high-chair, some posters, a mounted camera, and a one-way mirror.

The still-face procedure consists of three brief episodes, including 2-minutes of normal *face-to-face interaction*, 2-minutes of maternal *still face* -- where the mother assumes an affectively neutral, non-responsive expression, and 2-minutes of *reunion* or resumption of interaction. During the procedure, the infant sits opposite the mother in the high-chair; no toys or other objects are available to either participant. The mother is asked to interact normally during the first and third sequences, and is instructed not to talk, smile, or touch the infant during the still face. The episodes are separated by short intervals during which time the mother turns away.

The 14-month Strange Situation, which consists of eight 3-minute episodes of separation and reunion with the mother, was also timed and videotaped through a one-way mirror. In this procedure, the infant is allowed to play freely on the floor while the mother periodically leaves and returns to the room. A stranger is introduced intermittently. The room in which this paradigm took place was the same as that used for the still-face procedure, except that in this case no high-chair was present, toys were allowed the infant, and magazines were provided to the mother.

Measures

Still Face Situation

Behavioral data from 10-month old infants was obtained during the reunion or re-engagement sequence of the still-face procedure, and coded and analyzed for infant, maternal, and dyadic variables.

Infant Affect

Infant affect was coded with the Negative Affect Scale (NAS) for the presence of negative affect, as assessed during twelve 10-second intervals (2 minutes) of reunion behavior following the still face. Although information regarding reliability on the NAS measure was unavailable, studies using similar instruments have reported good results (see, for example, Braungart & Stifter, 1991; Frodi & Thompson, 1985; and Thompson & Lamb, 1984). Reliability data for the present study is provided below.

Negative affect was defined as any combination of vocalizations or facial expressions conveying a state of distress or aversion, and could include such behaviors as grimace, frown, protest, whimper, grunt or cry -- with or without body movements -- lasting at least one second in length. Behaviors or expressions of less than a second were not coded in this schema. During coding, each of the 12 mutually-exclusive intervals was coded for the presence or absence of negative affect and the number of intervals spent in the expression of negative affect was determined.

Reliability

In order to assure good reliability in the present study, an independent coder blind to the hypotheses of the study was trained to code infant negative affect. Results of the interrater agreement analysis showed very good reliability, in

that the intraclass correlation coefficient with an approximate 95% confidence interval was .98 for infant negative affect (.80 is considered good reliability). Potential coder drift was also assessed during normal coding procedures by the independent co-coding and conferencing of every fourth tape. The results of this analysis showed good reliability in this case as well, in that the intraclass correlation coefficient with an approximate 95% confidence interval was .94 for infant negative affect.

Dyadic Repair

Latency to interactive repair was assessed with the Dyadic Repair (DR) measure, which was derived from the Negative Affect Scale. Dyadic repair was defined as the absence of negative affect, distress, or aversion to interaction for a block of at least four consecutive 10-second intervals, out of 12, during reunion following the still face.

Reliability

The assessment of interrater reliability on the dyadic repair measure in terms of both training and normal coding procedures resulted in perfect agreement in both cases, or Kappa values of 1.00 and 1.00.

Maternal Emotion Regulation Strategies

Maternal emotion regulation strategies were coded for their occurrence with the Maternal Emotion Regulation Strategies (MERS) scale, as assessed during twelve 10-second intervals (2 minutes) of reunion behavior following the still face. The MERS scale was adapted from criteria developed by Stansbury et al., 1996. Used primarily in unpublished studies, this emotion regulation measure was originally created to evaluate cortisol levels and stress in 12-18 month old infants, as well as to determine strategies mothers used to help regulate infant

emotional state during free play. In that the present study had different population characteristics and laboratory conditions than those of the Stansbury study, a number of revisions to the original measure were required.

First, of the original categories *comfort*, *distract*, *instrumental*, and *cognitive*, the category *instrumental* was omitted, as this behavior was not applicable to the current study. Second, two additional categories, *affect/negative* and *affect/positive*, were added, as they related to otherwise unaccounted for affective responses involving infant or maternal emotion or state. The *affect* criteria was adapted from research by Goldberg et al., 1994, in their study of maternal responsiveness, affect, and infant attachment following the Strange Situation reunion. This is a work that shares some, although not all, of the theoretical and methodological underpinnings of the present study. Third, the category *distract* was further delineated into two groups, *distract/object* and *distract/maternal*, in order to obtain more information about maternal directing of infant attention and the use of maternal play (Saxon, Frick, & Colombo, 1997). Thus, the revised MERS scale yielded six non mutually-exclusive categories: *comfort*; *affect/negative*; *affect/positive*; *distract/object*; *distract/maternal*; and *cognitive/reason*.

In the present study, maternal emotion regulation strategies were defined as follows: (a) *comfort* = offers comforting, soothing comments in response to infant's emotional state or affect. Includes physical interventions like hugging, kissing, patting, and stroking, as well as verbal interventions; (b) *affect/negative* = offers references to or labels of emotional, experiential state or affect, with emphasis on negative affect, lack, or need. May include self-references; (c) *affect/positive* = offers references to or labels of emotional, experiential state or

affect, with emphasis on positive affect or tone; *(d) distract/object* = directs infant attention towards objects or other activities. Involves external focus on objects or items found in the laboratory or situation, including a one-way mirror, wall posters, camera, etc.; *(e) distract/maternal* = directs infant attention towards mother and/or the use of play, games, or songs. Can include the use of high-chair or other objects (maternal clothing or jewelry), although only in the context of mother-infant play; and *(f) cognitive/reason* = gives reasons, descriptions, exclamations, interpretations or other information-based responses. May be action-oriented or may include comments on actions. Implies direction away from experiential or affect state.

As these categories were not mutually exclusive, more than one category could be coded during a 10-second interval. However, each category could be coded only once -- that is, for the presence or absence of that behavior. In this way, the number of intervals spent in each of the given categories was determined.

Reliability

Interrater reliability on maternal emotion regulation strategies was assessed on training tapes by coders blind to the hypotheses of the study. Results showed that intraclass correlation coefficients with confidence levels of approximately 95% ranged from 1.00 to .67, with overall reliability of about .90. Potential coder drift was also assessed during normal coding procedures by the independent co-coding and conferencing of every fourth tape. The results of these statistics yielded intraclass correlation coefficients with confidence levels of approximately 95% ranging from 1.00 to .81, with overall reliability of about .94. This shows that the degree of agreement between raters was more than adequate (.80 or above is considered good reliability on this measure). Appendix A presents

interrater reliability information on each of the six categories for both training and normal coding procedures.

Strange Situation

Behavioral data from 14-month old infants was obtained during the Strange Situation, a valid and reliable measure assessing separation and reunion responses in infants, as based upon the criteria developed by Ainsworth & Wittig (1969).

Infant Attachment: Infant attachment was classified according to behavioral ratings made by an outside laboratory trained in coding procedures for each of five interactive behaviors exhibited during the reunion episodes of the Strange Situation. These behaviors were: *proximity seeking, contact maintenance, avoidance and resistance to mother, and crying during reunion*. On the basis of these analyses, infants were classified according to three patterns of attachment, (A) *insecure-avoidant*; (B) *secure*; and (C) *insecure-resistant*.

For all tests in the present study, significance levels were defined as a P value of $< .05$ (two-tailed).

Hypotheses

Hypothesis 1. It was expected that most 10-month olds would exhibit some degree of negative affect, distress, or aversion to interaction following the still-face episode of the still-face procedure. Negative affect was measured with the Negative Affect Scale and was assessed during twelve 10-second intervals of the still-face reunion. Negative affect was construed as the presence of four or more 10-second intervals of that behavior.

Hypothesis 2. It was expected that there would be an association between the

the regulation strategies mothers used to respond to their 10-month old infants following the still face and subsequent dyadic repair outcomes. Maternal strategies were measured with the Maternal Emotion Regulation Strategies scale during the twelve 10-second intervals of the still-face reunion. Information about dyadic repair outcomes was calculated with the Dyadic Repair measure, derived from the Negative Affect Scale. Dyadic repair was demonstrated by the absence of negative affect for a block of at least four consecutive 10-second intervals.

2a: It was predicted that mothers of 10-month olds who used more age- and situation-appropriate regulating strategies, like *distract maternal*, *distract/object*, or *cognitive/reason*, would have more successfully-negotiated dyadic repair outcomes.

2b: It was predicted that mothers who relied on less age- and situation-appropriate regulating strategies, like *comfort*, *affect negative*, or *affect positive*, would have poorer dyadic repair outcomes.

Hypothesis 3. It was expected that greater usage of less appropriate age- and situation-appropriate regulating strategies at 10-months of age, as postulated in Hypothesis 2b, would be related to greater levels of insecure infant attachment at 14-months of age, as measured by the Strange Situation.

CHAPTER 3

RESULTS

The results of analyses provided in this chapter include descriptive statistics and group comparisons for infant, maternal, and dyadic variables. Subsequent presentation of analyses address the hypotheses of the study.

Infant Negative Affect

In terms of infant affect, infants spent an average of 5.23 out of twelve 10-second intervals (2 minutes) of the still-face reunion engaged in the display of negative affect. The median for this variable was 6, suggesting a close to normal distribution.

Overall, 82.9% of the infants presented some degree of negative affect following the still face, while 17.1% or six of the 35 infants displayed no negative affect. Using a criterion of four or more intervals out of 12, 65.8% of the sample spent at least 1/3 of the still face reunion engaged in some behavioral distress or aversion to interaction. Appendix B presents the frequency and percentage of time, in terms of intervals out of 12, in which negative affect was displayed.

Maternal Emotion Regulation Strategies

In response to infant stress, mothers used a variety of maternal emotion regulation strategies. These frequencies are presented in Table 1. Frequencies were derived from the number of 10-second intervals out of 12 that included those behaviors. Categories were not mutually exclusive.

Table 1
 Frequency of Usage (In Number of Intervals Out of 12)
 of Maternal Emotion Regulation Strategies (MERS)

Maternal Strategy	Mean	Median	SD
Comfort	3.06	3.00	2.86
Affect/Negative	.57	.00	.81
Sq. Rt., Affect/Negative ^a	.47	.00	.60
Affect/Positive	.23	.00	.49
Sq. Rt., Affect/Positive ^b	.21	.00	.43
Distract/Object	1.31	1.00	1.91
Sq. Rt., Distract/Object ^c	.77	1.00	.86
Distract/Maternal	8.49	9.00	2.82
Cognitive/Reason	4.37	4.00	2.79

a, b, c

Transformed square root values are reported in the text of this paper.

Examination of Table 1 shows that, by far, the most frequently used emotion regulation strategy was *distract/maternal*. On average, mothers spent 8.49 out of 12 intervals engaged in some type of maternally-directed game, song, or other play. These responses occurred almost twice as often as the next most frequent strategy, *cognitive/reason*, a category that involved the use of descriptive, functional, or information-based responses. *Cognitive/reason* responses occurred

in an average of 4.37 out of 12 intervals, followed by the next most common strategy, *comfort*, which occurred in an average of 3.06 out of 12 intervals.

The three remaining maternal strategies, *distract/object*, *affect/negative*, and *affect/positive*, were less well represented in the sample. In order to reduce the level of skewedness of these responses and to meet the assumptions of a normal distribution, square root transformations were performed. These data are reported in the text of this paper. Of these variables, the *distract/object* response, which involved directing infant attention towards objects or activities external to the dyad, occurred in an average of .77 out of 12 intervals. Affect-labeling type of responses occurred slightly less frequently, with mothers using *affect/negative* and *affect/positive* responses in an average of .47 and .21 out of 12 intervals, respectively.

Dyadic Repair and Attachment Variables

Dyadic repair outcomes, categorical variables derived from the assessment of blocks of at least four 10-second intervals without the presence of negative affect, resulted in the following distribution: 54.3%, or 19 of the 35 dyads experienced a condition of repair within the 2 minutes following the still face, while 45.7%, or 16 of the dyads did not achieve repair within that time.

Attachment outcomes, also categorical variables, had a similar distribution: 54.3%, or 19 of the 35 infants were classified as *securely attached* at 14-months, while 45.7%, or 16 infants were classified as *insecurely attached* (A + C).

Hypothesis 1

The hypothesis predicting a *carry-over effect* of negative affect following the still face was confirmed, with the mean number of intervals of negative affect, 5.23 (SD .62), achieving significance, $t(34) = 8.435$, $p = .001$. This finding demonstrates that this group of infants exhibited a moderate degree of negative affect in the period following the still face, a result which corroborates other still-face literature regarding the stressful effects of an episode of maternal unresponsiveness on the infant (Weinberg & Tronick, 1996).

Hypothesis 2

The set of hypotheses predicting a link between the emotion regulation strategies mothers used to respond to their infants following an episode of stress and the incidence of subsequent dyadic repair was partially confirmed. Hypotheses 2a and 2b were analyzed with t-tests in order to evaluate differences in dyadic repair outcomes based on maternal strategies used. Table 2 presents a comparison of means and standard deviations of the two repair groups: dyadic repair ($n = 19$) and no dyadic repair ($n = 16$). Examination of Table 2 shows that some strategies were significantly related to repair outcome, while others were not.

In terms of prediction, the first hypothesis, 2a, stated that mothers who used more age- and situation-appropriate regulating responses during reunion following the still face, such as *distract/maternal*, *distract/object*, and *cognitive/reason*, would have more successfully negotiated repair outcomes.

However, when the two repair groups were compared, no significant differences emerged for these maternal variables (i.e., *distract/object*, $t(33) = 1.45$, ns; *distract/maternal*, $t(33) = -.03$, ns; or *cognitive/reason*, $t(33) = .88$, ns). In other words, the use of distracting type of responses was not related to the amelioration of infant distress or to the enhancement of interactive repair.

Table 2

Maternal Emotion Regulation Strategies (In Number of Intervals Out of 12) Classified According to Dyadic Repair Outcome

Maternal Strategy	Dyadic Repair (n = 19)		No Dyadic Repair (n = 16)		t(df)
	Mean	SD	Mean	SD	
Comfort	2.05	2.59	4.25	2.77	-2.42(33)*
Affect/Negative	.21	.71	1.00	.73	-3.23(33)**
Sq. Rt., Affect/Negative ^a	.14	.45	.85	.54	-4.26(33)***
Affect/Positive	.37	.60	.00	.25	2.03(33)+
Sq. Rt., Affect/Positive ^b	.34	.52	.00	.25	2.05(33)*
Distract/Object	1.74	2.28	.81	1.22	1.45(33)
Sq. Rt., Distract/Object ^c	.94	.95	.57	.72	1.27(33)
Distract/Maternal	8.47	2.55	8.50	3.20	-.03(33)
Cognitive/Reason	4.74	3.35	3.94	1.95	.88(33)

a, b, c

Transformed square root values are reported in the text of this paper.
+ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

While there were no findings in terms of a link between distracting or cognitive type of responses and the incidence of interactive repair, this was not the case for the more empathic or affect-related responses. As stated in hypothesis 2b, it was predicted that mothers who used less age- and situation-appropriate regulating responses following the still face, such as *comfort*, *affect negative*, and *affect positive*, would have poorer dyadic repair outcomes, as manifested by the continued incidence of negative affect and distress.

In this instance, when the two repair groups were compared, significant differences emerged. As can be seen in Table 2, *comfort* responses occurred, on average, more than twice as often in the non-repair group ($M = 4.25$, $SD = 2.77$) than the repair ($M = 2.05$, $SD = 2.59$) group, suggesting that in this context at least, soothing or empathic type of responses enhanced rather than diminished infant distress. Analysis showed that this effect was significant, $t(33) = -2.42$, $p < .05$.

This was also the case for the *affect negative* labeling response which, although its numbers were small, occurred in significantly more intervals of the non-repair ($M = .85$, $SD = .54$, transformed data) than the repair ($M = .14$, $SD = .45$, transformed data) group, $t(33) = -4.26$, $p < .001$. This finding suggests that, like the *comfort* responses, references to negative affect state had a contradictory effect on mothers' management of infant distress.

The *affect positive* response, although its numbers too were small, similarly proved to be significant, $t(33) = 2.05$, $p < .05$. However, unlike the

previous results, this effect was in the opposite direction. In fact, positive references to affect state occurred significantly more frequently in the repair ($M = .34$, $SD = .52$, transformed data) than the non-repair ($M = .00$, $SD = .25$, transformed data) group, thus providing some evidence for the means necessary for the successful resumption or re-establishment of a positively-toned interaction.

Hypothesis 3

The hypothesis predicting a link between the emotion regulation strategies mothers used to respond to their infants following an episode of maternal unresponsiveness and later infant attachment classification was not confirmed. Hypothesis 3 was analyzed using t-tests to compare secure ($n = 19$) and insecure ($n = 16$) infants at 14-months of age in relation to the strategies their mothers used to respond to infant stress at 10-months of age. The secure group of infants was comprised of infants rated "B" during the Strange Situation; the insecure group was made up of infants classified "A" (anxious avoidant) and "C" (anxious resistant).

Table 3 presents the means and standard deviations of the two attachment groups in terms of number of intervals out of 12 in which the maternal behaviors occurred. Examination of Table 3 shows that there was little difference between groups on any of the maternal emotion regulation strategies used and that none of these differences approached significance (i.e., *comfort*, $t(33) = .82$, ns; *affect/negative*, transformed data, $t(33) = .97$, ns; *affect/positive*, transformed data, $t(33)$

= .27, ns; *distract/object*, transformed data, $t(33) = .21$, ns; *distract/maternal*, $t(33) = .66$, ns; and *cognitive/reason*, $t(33) = .82$, ns).

These results suggest that factors or mechanisms other than maternal emotion regulation strategies, per se, are involved in the establishment and organization of infant quality of attachment.

Table 3

Maternal Emotion Regulation Strategies (In Number of Intervals Out of 12) Classified According to Attachment Outcome

Maternal Strategy	Secure (B) (n = 19)		Insecure (A + C) (n = 16)		t(df)
	Mean	SD	Mean	SD	
Comfort	3.16	2.73	2.94	3.09	.82(33)
Affect/Negative	.63	.96	.50	.63	.64(33)
Sq. Rt., Affect/Negative ^a	.47	.66	.46	.55	.97(33)
Affect/Positive	.32	.58	.13	.34	.24(33)
Sq. Rt., Affect/Positive ^b	.29	.50	.13	.34	.27(33)
Distract/Object	1.05	2.07	1.63	1.71	.38(33)
Sq. Rt., Distract/Object ^c	.60	.85	.97	.85	.21(33)
Distract/Maternal	8.68	2.47	8.25	3.26	.66(33)
Cognitive/Reason	4.47	2.61	4.25	3.07	.82(33)

a, b, c

Transformed square root values are reported in the text of this paper.

Association Between Dyadic Repair and Attachment

Although not originally proposed, a final analysis was undertaken in order to ascertain whether or not there was an association between dyadic repair and attachment variables. Table 4 presents the number and percentage of cases in the two dyadic repair groups, classified according to secure or insecure attachment category.

Table 4
Number and Percentage of Cases of Dyadic Repair Classified By
Security of Attachment

	Secure (B)		Insecure (A + C)	
	n	%	n	%
Repair	13	68.4	6	37.5
No Repair	6	31.6	10	62.5

A Pearson Chi-Square test was performed on this data. The resulting value nearly approached but did not reach significance at the two-tailed .05 level, $\chi^2(1, N = 35) = 3.35, p = .067$. Although not a robust finding, this result suggests a trend linking successfully negotiated dyadic repair outcomes at 10-months of age and later security of attachment.

CHAPTER 4

DISCUSSION

While maternal responsiveness has been assumed to play an important role in the development of infant socio-emotional functioning, the exact nature of this role has not been adequately determined. Two important premises in this regard have been advanced. The first suggests that critical to social functioning is the way negative affect is used and communicated (Carlson & Sroufe, 1995). The second proposes that attachment needs are activated during times of perceived stress (Bowlby, 1969).

The still-face procedure's episode of maternal unresponsiveness has been described as "a short-lived, experimentally produced form of neglect" (Tronick and Weinberg, 1997, p.66), and a situation that "assesses the infant's relationship history with the mother" (Cohn, Campbell, & Ross, 1991, p.378). While many research studies have documented a carry-over of negative affect following the still face, few studies have empirically investigated the effects of subsequent maternal responsiveness on dyadic or infant outcomes, including infant attachment.

In order to investigate the organizational pathways linking maternal characteristics, dyadic processes, and infant outcomes, the present study utilized the re-engagement episode of the still-face situation for the purposes of measuring infant negative affect, dyadic repair, and infant security of attachment. Consistent with the views of Lamb et al. (1987), an episode of dysregulation and stress reduction rather than normal interaction was thought to be the most effective forum in which to examine the impact of social expectancies on infant development.

Toward these ends, the study had two aims. The first aim was to explore how mother-infant pairs negotiate the process of disruption and repair following an episode of interactive stress. The second aim was to investigate the specific ways by which maternal characteristics and styles of interaction contribute to the organization of infant attachment and impact upon later socio-emotional functioning. Using a perturbation of mother-infant interaction -- in this case the still-face situation -- the specific reparative strategies and distress-management techniques used by the mother following the still face and the quality of her responsiveness were assessed.

With these goals in mind, the study developed a set of reliable measures with which to code infant negative affect, maternal emotion regulation strategies, and dyadic repair. These variables were assessed during the reunion episode of the still-face procedure at 10-months of age. Also considered was the classification of infant attachment, as determined by the Strange Situation four months later.

Findings from the study demonstrated two broad points. The first was that 10-month old infants, like their younger counterparts, experience negative affect and distress following an episode of maternal unresponsiveness. The second was that the specific ways in which mothers respond to their infants, particularly in regard to their affective responses, impact upon subsequent infant and dyadic social and regulatory functioning. Overall, these findings endorse the view that interactions between mother and child influence the developing psychic structure of the infant, and that mothers' style of emotional communication in the context of distress repair sequences likely mediates the transmission of attachment security.

In confirming a *carry-over effect* of infant negative affect following the

still face, the study supports other research demonstrating that negative affective states in the infant are "not easily assuaged" by the resumption of maternal interaction (Weinberg & Tronick, 1996), and that in response to infant distress mothers become more active and responsive communicative partners (Gianino & Tronick, 1988). This is consistent with previous research, albeit with younger infants, regarding the stressful, dysregulating effects of an episode of maternal unresponsiveness on the mother-child interaction (Field, Vega-Lahr, Scafidi, & Goldstein, 1986; Fogel, Diamond, Langhorst, & Demos, 1982; Tronick, Als, Adamson, Wise, & Brazelton, 1978).

Descriptive analyses of the data revealed that about 85% of the 10-month olds expressed some degree of behavioral distress or aversion to interaction following the still face. On average, these infants spent about half the given number of intervals engaged in the expression of negative affect. Moreover, slightly less than half the mother-infant pairs experienced a condition of interactive repair -- or latency to neutral or positive infant affect -- during this time period, as opposed to 19 of the 35 pairs who achieved repair.

Analyses also revealed that in response to infant distress mothers used some type of maternal distraction, often in the form of a song or a game, more than twice as often as any other regulating strategy. These responses occurred in an average of 75% of the intervals. Following this, mothers offered descriptive, functional, or information-based responses in an average of 33% of the intervals, and empathic, soothing, or comforting comments in an average of 25% of the intervals. They also directed infant attention towards an external focus or object, and referred to emotional state or affect, in an average of less than 8% of the intervals, each.

The prediction of a link between maternal emotion regulation strategies and dyadic repair outcome was confirmed. Although the data indicated that three of the regulating strategies, *distract/maternal*, *distract/object*, and *cognitive/reason*, were not related to repair outcomes, an association was found between repair outcomes and the remaining three strategies, *comfort*, *affect/negative*, and *affect/positive*.

Specifically, comforting type of responses were found to occur in twice as many intervals of the non-repair than the repair group, suggesting that following an episode of maternal unresponsiveness, at least, soothing or empathic type of responses *enhance* rather than diminish infant distress. Maternal references to negative affect state also occurred in significantly more intervals of the non-repair than the repair group, implying that in this case as well, a focus on negative affect or negative experiential state has a contradictory effect on mothers' management of infant distress and consequent engagement of interactive repair.

On the other hand, maternal references to positive affect state similarly distinguished repair groups, although in the opposite direction. Positive references to affect state occurred more frequently in the repair than the non-repair group (in which they were absent), providing some evidence of the pathway leading towards the establishment or resumption of a regulated, positively-toned interaction.

Contrary to prediction, the expectation of a link between maternal emotion regulation strategies and later infant attachment security was not supported. This suggests that while attachment processes are developing or consolidating during the latter part of the infant's first year, other variables and mechanisms than maternal emotion regulation strategies are involved. However, it should be noted nevertheless that the hypothesis predicting an association between dyadic repair

and attachment outcome yielded promising results, implying an indirect link between successful repair outcomes -- and, by extension, quality of interaction -- and infant attachment security.

Interpretations of the Findings

The findings from the present study provide evidence that although the infant has achieved new skills and developmental milestones by 10-months of age, affective exchanges between mother and infant remain "the primary *medium* and the primary *subject* of communication" (Stern 1985a, p.133). How these results are contextualized will be addressed below.

On the basis of the current findings it is asserted that, given other developmental attainments in the infant, the bridge between maternal characteristics -- in this case, maternal emotion regulation strategy usage, dyadic repair, and infant attachment outcome -- is the mother's *affective* communications in the context of distress regulation. Moreover, individual differences in regulation strategies and patterns of interaction between mother and child appear to be in place by 10-months of age.

According to evidence from this data, infant affective expressions are organized, in part, by maternal attention- and affect-regulation responses, and further differentiated by positive and negative affect-regulating ones. It is suggested that maternal characteristics and behaviors, particularly the mother's ability to regulate affective communications, contribute to the development of infant self-regulation, which in turn is affected by and affects the ongoing mother-infant relationship. It is also likely that the organizing factor between maternal characteristics and styles of interaction on the one hand, and child regulatory and

attachment behaviors on the other, is the *mother's* ability to repair and transform negative into positive affect.

It is further suggested that mothers' abilities to regulate affective states rather than minimize or be overwhelmed by them leads to the condition of interactive repair. In this way, repeated patterns of affectively-toned interactions are hypothesized to impact upon the attachment bond and upon the infant's developing representations of self and other (Slade, 1999; Stern, 1985b). However, it is not only "type" of reparative response but also means and measure of presentation that affects dyadic regulation. For example, Grolnick et al. (1997) found that children of mothers who took responsibility for regulating distress "beyond what the child needed" had more difficulty and exhibited greater distress when required to regulate independently.

Evidence from the current study supports the premise that a mother's sensitive responsiveness to infant distress -- particularly in regard to her style of emotional communication -- plays a critical, if sometimes counterintuitive, role in the development of infant regulatory and coping behavior. Although not fully understood, it may be postulated that in situations of repeated stress -- or in conditions of ambiguity at least -- too much empathy or identification on the part of the mother or too great a focus on, or control over, infant negative affect state prevents the infant from internalizing those mechanisms or processes necessary for ego development and for a condition of increased self-reliance and self-regulation.

In response to the resumption of interaction following the still face, maternal distress-regulating strategies fell into one of two general categories or domains. These domains included: a) *attention-regulating*, generic, or cognitive type of responses concerning the use of distractions and information sharing, and

b) *affect-regulating* type of responses, involving the use of comfort-related comments and references to affect state or emotion, both negative and positive.

It was demonstrated in this study that all mothers made use of the generic, attention-regulating strategies like *distraction* and *cognitive:reason*, ostensibly in order to resume normalcy in their interactions with their infants. These responses were assumed to be consistent with the attentional and language capabilities of the older infant. Nevertheless, they did not distinguish groups in terms of either repair or attachment outcome. However, this was not the case for the *affect-regulating* responses, which followed two distinct pathways. In subsequent discussions, these affect-regulating pathways will be referred to as negative and positive distress regulation.

The first affect-regulating pathway in this study, *negative distress regulation* -- not to be confused with negative affective display -- involved a maternal focus on or attention to negative affect, as manifested by the incidence of comforting or soothing comments and/or references to negative experiential state, discomfort, or need. An example of this response would be: "You're mad at me, aren't you?" "Please don't cry," or "Ohh, poor baby."

The use of negative distress regulation strategies was significantly related to a state of continued distress and dysregulation. In addition to any other function or utility of these responses, they may serve to undermine the generally accepted principle that "sensitive" or "responsive" parenting strategies are, under all circumstances, *empathic* or *comforting* ones.

Current findings linking negative distress regulating responses with continued display of negative affect are consistent with the few studies in the literature that have undertaken to examine the effects of parental interventions with

children in response to an episode of stress. For example, Gonzalez et al. (1993) reported that in a situation characterized by potential distress, in this case a routine but stressful medical procedure, a condition of *parental comfort* and *reassurance* was related to higher levels of distress than was a condition of *parental distraction*.

Lewis & Ramsay (1999) also found differences in maternal soothing responses to infant distress during inoculations and other potentially dysregulating situations. These authors reported that maternal soothing was *not* related to a reduction in either cortisol level or behavioral response to stress. However, this study did not assess maternal emotion regulation strategies other than soothing, nor did it look at differences in attachment security outcome or other qualities of the dyadic relationship.

The second affect-regulating pathway in this study, *positive distress regulation*, involved a focus on or attention to positive affect, as manifested by the utilization of references to positive experience, affect, or state. An example of this response would be: "Hooray for being a good girl!" "You love those, don't you?" or "See, look at the smile!" The use of this strategy was significantly related to a condition of dyadic repair. The findings associating positive affect and dyadic repair are consistent with those of Tronick and his colleagues in their still face research (Cohn & Tronick, 1987; Tronick, 1989; Tronick & Weinberg, 1997).

Some studies have reported that maternal positive affect directly predicts attachment security (Estes, Lamb, Thompson, & Dickstein, 1991). Although individual differences in maternal emotion regulation responses did not predict attachment security in this study, a result that would have thereby strengthened the associations that were found, the data nevertheless revealed a trend associating

successful repair outcomes at 10-months of age and infant secure attachment at 14-months of age. This finding is consistent with those of Del Carmen et al. (1993), who demonstrated that variables measuring mother-infant dyadic behavior, specifically factors that involved distress management, were the best predictors of attachment security in infants. The present results also corroborate findings by Cohn et al. (1991), who reported that greater levels of dyadic repair at 4- to 6-months of age were associated with increased attachment security at 1 year.

While it would have been advantageous in terms of the present thesis to have found a direct link between maternal positive distress regulation and attachment security, the results of this study nevertheless reveal the special role positive affect appears to play as it relates to the quality of the mother-infant interaction.

In this regard, some mutual-regulation theorists have stressed that reparation of interactive mismatches and errors rather than synchrony or positive affect, *per se*, is what influences later developmental outcome (Tronick & Weinberg, 1997). However, from an interpersonal-developmental perspective the mother's primary goal and objective is to reinforce the infant's positive affective experiences (Stern, 1985a). This would include facilitating dyadic repair following a disruption. These positively-toned and attuned interactions would then contribute to the infant's developing sense of self, as well as to the quality of the mother-infant relationship (Haft & Slade, 1989; Stern, 1985a).

In any case, both of these perspectives consider maternal positive affect and positive emotional involvement to be critical components of a well-functioning dyadic system. In light of the current findings, it may be suggested that maternal positive affect and positive dyadic experience serve as protective factors against

excessive distress and disorganization in the infant, thereby allowing infants to recover from any expectable carry-over of negative affect following the experience of dyssynchrony, mismatch, or interactive stress. The link found here between dyadic repair and attachment suggests that repair is a critical variable of "sensitive" parenting and one that it is best accomplished through positive affective means.

Organizational-Structural Perspectives

The process of re-engagement following the still face has been suggested to produce not only a sense of ambiguity or emotional ambivalence in the infant (Weinberg & Tronick, 1996), but also an experience of anxiety and discomfort in the mother (Mayes, Carter, Egger, & Pajer, 1991). In this regard, one study investigating mothers' reactions to the still face found that those mothers who felt the most discomfort during the still face returned to the interaction with more soothing or comforting comments directed towards their infants (Mayes, Carter, Egger, & Pajer, 1991).

Different theoretical perspectives inform how the above-mentioned factors and those of the present study are interpreted, including the means by which maternal regulation and repair strategies could impact upon infant regulatory and attachment organization. For example, while biological contributions are thought to play an important role in the development of infant socio-emotional functioning, a topic that will be subsequently addressed, a fuller understanding of the present findings may be better derived from an *organizational-structural* perspective -- that is, a perspective encompassing interpersonal-developmental, emotion-regulation, mutual-regulation, and attachment theories.

In a general sense, the findings from the current study may be interpreted from an organismic-developmental perspective (Werner, 1957). According to this

view, during the course of development diffuse modes of functioning give way to more complex ones, "proceed(ing) from a relative globality and lack of differentiation to a state of increasing differentiation, articulation, and hierarchical integration" (Werner, 1957, p.126).

From an organizational standpoint, the infant's developing attentional, sensory, motoric, emotional, and cognitive processes become organized through regulatory interactions with the caregiver (Carlson & Sroufe, 1995). That is, given any innate, biological differences at birth (Korner, 1971), it is the quality of caregiver sensitivity and flexibility that is critical to the developmental needs and requirements of the individual infant.

This organization is central to the way the infant processes, coordinates, and interprets information, and is thought to impact upon various internalization processes in the infant, as well as upon the quality of mother-infant attachment, dependent upon quality of maternal care (Carlson & Sroufe, 1995; Reider & Cicchetti, 1989; Sroufe, 1996).

Affective Communication

From the perspective of interpersonal-developmental theory, it is suggested that quality of maternal care is internalized and represented by the infant, which in turn influences future affective communications (Stern, 1985a; 1985b). Stern (1985b) refers to these as RIGs, or representations of interactions that have been generalized. RIGs have been conceptualized as episodic "building blocks" of internal working models of relationships -- themselves considered to be unconscious representations organized into a larger cognitive framework.

These concepts of *representations of generalized interactions* and *internal working models* differ theoretically in that the former includes expectancies about

multiple types of interaction -- including psychological, cognitive, and affective, including attachment experiences -- while the latter refers primarily to expectancies about attachment organization and regulation.

Viewed from an interpersonal-developmental perspective, the nature of the mother's internal affective experience is thought to "inform" the affects she acknowledges and attunes to in early infancy, thereby differentiating shareable and unshareable feelings and experiences (Haft & Slade, 1989). Given the results of the current study, it may be theorized that maternal negative and positive distress regulation pathways are, in part, the specific means by which these affective mechanisms are transmitted. That is, through these affective communications infants "begin to structure their own affects through the prism of their mother's internal world" (Haft & Slade, 1989, p. 18).

Theoretical discussions about affective communication in early infancy have maintained that interactive exchanges during this time impact upon the development of the infant's core sense of self (Stern, 1985b). Placed in the context of dyadic regulation, previous experiences of successful reparation and subsequent transformation of negative into positive affect may aid the infant in developing a *positive affective core*, as characterized by feelings of mastery and effectance (Emde, 1991)

In the case of dyadic misregulation, however, the mother's unavailability may force the infant into a situation of over-reliance on immature coping and self-regulatory abilities. This generates a *negative affective core* with accompanying feelings of inconstancy and ineffectance (Emde, Kligman, Reich, & Wade, 1978; Gianino & Tronick 1988). Seen from this view, it may be postulated how

interactive patterns of distress regulation, as revealed by the present study, might impact upon the organization of later infant social and emotional functioning.

Emotion Regulation

The finding of a *carry-over effect* of infant negative affect following the still face may be construed as a condition of frustration in the face of a blocked, goal-oriented behavior (Fox, 1989) -- in this case, the emotional and physical access to the mother. It may also be seen as a violation of a response-event contingency (Gergely & Watson, 1996). The negative display may reflect the infant's expectation of maternal intervention -- in order to help regulate the feeling of negative affect -- or it may instead indicate the infant's emotional ambivalence about the still face experience itself (Weinberg & Tronick, 1996).

Alternately, the mother's still face may be perceived by the infant as a deviant communication causing fear or alarm, which in turn is misattributed to the mother, thus creating a condition of further dysregulation (Gergely & Watson, 1996).

The developmental literature suggests that the set of processes that characterizes emotion regulation involves the initiation, maintenance, and modulation of emotional expressions (Grolnick, Bridges, & Connell, 1996). Cassidy (1994) offers a relationship-based approach to the socialization of emotions that focuses on the link between emotion regulation and attachment security. This view posits that individual patterns of emotion regulation serve to maintain the infant's relationship with the caregiver and that these patterns are influenced by the infant's representations of her.

According to this perspective, infants may restrict or heighten expression of affect as adaptive strategies used in order to placate the mother or to insure her

further involvement. In this way, interventions or strategies used by the mother to control negative affect that do not effectively repair distress may not only fail to help the infant regulate affect, but may also contribute to a state of heightened negative arousal and emotionality (Cassidy, 1994).

In light of present findings, a failure to repair interactions with the use of maternal regulation strategies like *comfort* and *affect-labeling* may contribute to a continued, if not a heightened, state of negative arousal and emotionality. Nevertheless, it should be emphasized here that the subject of maternal comfort is not yet fully understood and thus requires further study.

It may also be tempting, at this point in the discussion, to attribute some of the present findings to the role of individual differences in infant temperament or reactivity, factors which have themselves been proposed to affect the display of negative affect (Bates, 1987; Buss & Plomin, 1984; Calkins & Fox, 1994; Fox, 1995; Rothbart & Derryberry, 1981).

However, it was not the intention of this study to investigate differences in infant negative states, per se, but rather to assess mechanisms associated with maternal responsiveness and their impact upon dyadic repair and infant attachment outcomes. While temperament and other innate factors are assumed to contribute to the organization of regulatory and attachment processes (see, for example, van den Boom's, 1988 study on interventions with irritable infants), they are nonetheless considered independent of the variables under study here. For other purposes, however, this study follows the distinctions made by Cassidy (1994), who in differentiating the concepts of *expressivity* and *reactivity* noted that "expressivity may be more directly linked to environment than reactivity since it

seems likely that the children's expressiveness will be influenced by the responses that significant people have made to their expressiveness" (p.247).

In any case, many studies stressing the relative importance of biological factors and their impact upon socio-emotional development nevertheless concede that interaction with the environment, including the manner in which the mother responds to the infant, forms the "lens through which the child then views the social world" (Fox, 1995, p.407). Some of this literature also acknowledges the explicit, if not causal, role that adults play in helping infants to modulate arousal and promote emotion regulation (see, for example, Fox, 1995; Gunnar, Mangelsdorf, Larson, & Herstgaard, 1989; Rothbart, 1985).

A number of diverse empirical studies support the current view that affect expression is subject to the distinct influence of maternal and dyadic factors. For example, one longitudinal study investigating the developmental manifestations of infant distress reported a normal decrease in the expression of negative affect over the course of the infant's first year (St. James-Roberts & Halil 1991). The study determined that 1- to 3-month olds cried an average of 121 minutes a day; however, when they reached 10- to 12-months, their crying had declined to 54 minutes a day. It was suggested that this change was the result of an interaction of environment factors -- specifically socialization processes -- and neural maturation.

Another study assessing infant negative and positive emotionality, family antecedents, and attachment consequences discovered a discontinuity of infant emotionality across development (Belsky, Fish, & Isabella, 1991). In this case, it was reported that infants who changed from high to low positive emotionality across the first year were also more likely to be judged insecurely attached at 1 year. Still another study examining maternal emotionality in relation to infant

predisposition to distress determined that maternal positive affectivity was associated with low proneness to distress, as opposed to maternal negative affectivity which was linked to high proneness to distress (Mangelsdorf, Gunnar, Kestenbaum, Lang, & Andreas, 1990).

Two broad patterns of "insensitive" caregiving styles have been delineated in the literature. One has been shown to involve a predominantly intrusive or dominating style of interaction; the other, a mostly inconsistent, passive, or withdrawn style of interaction (Ainsworth, Bell, & Stayton, 1974; Cohn & Tronick, 1989; Thompson & Lamb, 1983). In either case, subsequent infant behaviors including emotional expressiveness and the capacity to cope adaptively have been proposed to be "shaped by the diminished capacity of its signals to elicit appropriate parental responses" (Thompson & Lamb, 1983, p. 99). Such patterns have also been linked to insecure infant attachment (see Spieker & Booth, 1988, for a review) and subsequent psychopathology (Carlson & Sroufe, 1995).

In terms of the data from the present study, these investigations offer support for the hypothesis that over the course of the first year of life maternal affective communications impact upon the quality of dyadic repair in the face of interactive stress, with a maternal focus on negative affect state maintaining or exacerbating a condition of dysregulation, and a maternal focus on positive affect facilitating a state of dyadic repair. In this way, it may be argued, "biologically based variation in infant behavior is transformed in the context of the caregiver relationship" (Carlson & Sroufe, 1995, p. 584).

Mutual Regulation

From the perspective of mutual regulation theory, regulation is considered a set of processes that operates through ongoing, bidirectional communicative and

affective exchanges between mother and child (Gianino & Tronick, 1988; Tronick & Gianino, 1986; Tronick & Weinberg, 1997). In the context of this set of processes, normal interactions as well as stressful ones involve affective "processes of reparation" in which infant emotional states are regulated dyadically (Tronick & Weinberg, 1997). These authors view dyadic repair as a mutually-regulated event related to later attachment security (Cohn, Campbell, & Ross, 1992).

Tronick and his colleagues have maintained the importance of re-establishing mutual positive interaction within the dyad following an experience of interactive stress (Gianino & Tronick, 1988; Tronick, Ricks, & Cohn, 1982; Tronick & Weinberg, 1997), and note that prolonged exposure to dyadic disruptions leads to such consequences as insecure mother-infant attachment and defensive behavioral organization in the infant (Tronick, 1989). These authors further emphasize that reparation of interactive errors is the "critical process of normal interactions that is related to developmental outcome" (Weinberg & Tronick, 1997, p.65).

It has been suggested elsewhere that the quality of dyadic regulation "has consequences for emerging expectations concerning emotional arousal and the expression, modulation, and flexible control of emotions by the child" (Carlson & Sroufe, 1995, p. 590). In terms of the present study, it may be inferred that differentiated regulation of affect and its vicissitudes are, in part, what is transmitted by the mother to the infant. How these processes may become organized and internalized by the infant is the subject of the following discussion.

A number of mutual-regulation and other developmental theorists have suggested that by the end of the first year, the infant is not only able to share affective and attentional states, but has also developed expectancies regarding the

quality, contingent responsiveness, and predictability of the mother's interactions. It may be assumed that over time, chronic or repeated expectancies of *misregulation* and *disrepair* organize infant experience in the same way as do expectancies of *regulation* and *attunement* (Beebe & Lachmann, 1988; Weinberg & Tronick, 1996).

In other words, the condition of a state of intersubjectivity -- or shared attention, intention, and affect -- which emerges at about 7- to 9- months of age, includes situations of both intersubjective relatedness and intersubjective dyssynchrony and conflict (Biringen, Emde, & Pipp-Siegel, 1997). How the mother responds to and repairs situations of dyssynchrony and conflict is thought to influence the organization of infant representational models of attachment.

These social expectancies, adaptive or maladaptive, are believed to be originally stored as presymbolic representations that later become symbolized as the infant makes the transition from sensorimotor to formal symbolic functioning (Beebe & Lachmann, 1988).

In this regard, Spitz (1965) has noted that gestures and early verbal language conveying the word "no" are among the first symbols in a child's semantic communication code. He suggests that with greater motor, cognitive, and language abilities -- by about 9-months of age -- comes increased intersubjectivity, ego development, and a new level of autonomy. At this point in time, the infant gains a first understanding of environmental commands and prohibitions, as well as a gestural identification with the parental "no" (Spitz, 1965).

The still-face procedure, with its episode of maternal unresponsiveness, may be interpreted by the infant as demonstrating maternal non-verbal conveyance of the word, "no." In this way, and for the *older* infant, it is likely that the

resumption of a state of positive interaction, or a state in which the infant is positively reflected in the eyes of the mother, is critical for dyadic regulation to occur. How the mother handles infant negative affect displays in response to this and other *maternally-directed* negative, or prohibitive, interactions is thought to be fundamental to the developing mother-infant attachment organization.

Attachment

While all of the above perspectives are relevant to the present study, further discussion of the data will focus on interpretations viewed in the context of attachment theory. Attachment theory, another type of organizational or "structural developmental theory" (Sroufe, 1999), has provided a large body of research in support of its premises and assumptions.

From an attachment perspective, global or diffuse representations of feelings or experiences with the caregiver are organized into working models of relationships that are themselves subject to further modification. In this way, dyadic regulatory patterns reflect the history and organization of early mother-infant interactions, the affective quality of which underlies the attachment relationship (Carlson & Sroufe, 1995). Based on the current findings, it is hypothesized that negative and positive distress regulation patterns are internalized by the infant in the following manner.

According to attachment theory, working models of relationships are unconscious psychological representations shaped by a variety of biological, emotional, cognitive, behavioral, and social experiences organized and coordinated by interactions with the caregiver (Barrett & Vondra, 1999). This cognitive

organizational experience, shaped by caregiver responsiveness and availability, includes those aspects of social expectancies that guide infant strategies for regulating affect and coping with stress (Cassidy, 1994).

Attachment research has demonstrated that insecure attachment is linked to a defensive psychic organization and socio-emotional difficulties in childhood (Carlson & Sroufe, 1995). Some of these difficulties have been noted to include increased negative affect, brittle coping mechanisms, poor ego-resilience, and the inability to cope with frustration, as well as social incompetence, autonomy issues, cognitive inflexibility and impaired problem solving skills.

In the face of stressful experiences, it is hypothesized that these individuals will become overaroused, hypervigilant, or emotionally constricted as they attempt to modulate affect and confront the "activation of attachment feeling and behavior and the re-experiencing of emotional conflict that their defensive strategy was originally designed to control" (Carlson & Sroufe, 1995, p.604).

Secure attachment, on the other hand, has been associated with increased positive affect, affective expressiveness, responsivity, and self-reliance, as well as ego-resilience and self-esteem. In terms of the present study's findings, it may be postulated that qualities of positive affect, flexibility, self-reliance, and ego resilience are transmitted relationally, in part, through the mother's ability to successfully regulate and repair negative affect and interactive stress.

Transmission of Attachment

Individual differences in mental representations of self and early attachment experiences have been suggested to affect the later availability and degree of responsiveness in the mother -- and, by extension -- security of attachment in the infant (DeWolff & van IJzendoorn, 1995; van IJzendoorn, Juffer, & Duyvesteyn,

1997). Results from the present study suggest that these processes may be conveyed through affective communications between mother and child.

Other research has provided some evidence for this, as well. For example, studies investigating the impact of maternal characteristics and attachment behaviors on infant socio-emotional functioning have reported that mothers of securely-attached infants have more positive feelings about themselves and their childhood relationships than have mothers of insecurely attached infants (Tronick, Ricks, & Cohn, 1982). Additional studies have determined that mothers who respond sensitively and appropriately to their infants' signals and cues are more secure as a group than are other mothers (Ainsworth, Blehar, Waters & Wall, 1978; Belsky, Rovine, & Taylor, 1984; Egeland & Farber, 1984; Main, Kaplan & Cassidy, 1985).

Behavioral manifestations of this have also been demonstrated. For example, Crowell & Feldman (1991) found a link between mothers' inconsistent, confusing, and contradictory views of their early experience, and distortions and contradictions in regard to their infant's behavior during an episode of reunion following separation.

The condition of sensitive responsiveness has been suggested to allow both mothers and infants to orient or attune their interactions to the infant's attentional and affective state (Thompson & Lamb, 1983), both negative or positive. This is assumed to enable the mother to correct expectable mismatches and errors and other situations of dysregulation as they occur (Tronick & Gianino, 1988).

Moreover, the characteristics of maternal sensitivity and appropriateness imply that the mother is able to interpret infant signals and communications accurately, without internal distortions from her own preoccupations, needs, or

defenses (Bretherton, 1987). Some psychoanalytic and attachment theorists further note that it is through this pathway that the mother's inner world and unconscious experience impacts upon the infant's developing sense of self and other (Slade, 1999; Stern, 1985b).

Other writers have suggested that maladaptive responses to infant distress may be the result of unconscious strategies or projections used by the mother in order to control her relationship with the infant; or alternately, may reflect the mother's own unsuccessful experiences of regulation (Cassidy, 1994). How these affective experiences are transmitted or "learned" relates to the present findings and is an important area for further consideration.

The current findings maintaining a link between dyadic repair and attachment security can be interpreted by those developmental models that posit that internal representations or working models of relationships are built up over the course of repeated negative or positive interactions with the parent. These internal representations or working models of relationships are hypothesized to underlie the intergenerational transmission of attachment security (van IJzendoorn, 1995).

Attachment research has revealed that the impact of attachment-related experience can be measured not only in infancy, but throughout development. For example, the assessment of adult mental representations of attachment relationships has yielded additional insights into the mechanisms that guide the development of attachment security. The most frequently used of these methods is the Adult Attachment Interview (AAI), a structured interview that focuses less on the content of early emotional experience than on the organization and coherence of its narrative (Main, 1991).

Research on adult attachment has shown that adults who are able to consciously process painful attachment-related childhood experiences and give coherent, emotionally-rich accounts of their experiences are more likely to have infants who are securely attached (Bretherton, 1985; Main, Kaplan, & Cassidy, 1985; van IJzendoorn 1995). In a meta-analysis on the effects of adult attachment on infant attachment, van IJzendoorn (1995) found evidence of a strong association between maternal and infant attachment security

According to a number of studies on adult attachment, secure/autonomous mothers have been reported to provide coherent and flexible representations of their attachment experiences, exhibiting to a large degree cognitive and emotional flexibility, dimension, and range (see, for example, Fonagy, 1997). In contrast, insecure/dismissing mothers have been found to idealize the caregiver figure and to depict childhood events in a detached or contradictory way, often minimizing or denying affective experience. Insecure/preoccupied mothers have been shown to display overinvolvement with the caregiver figure, tending to become confused, overwhelmed, or flooded by unmodulated affects aroused by their depictions of childhood experiences (van IJzendoorn, 1995).

Theoretically, it has been suggested that internal representations in the infant involve the acceptance of the self in the eyes of the caregiver, while internal representations in the mother encompass her early attachment experiences, as well as the quality of her own emotional support and accessibility as an attachment figure (Bretherton, 1987). From this perspective, it may be assumed that the mother's capacity to form flexible, coherent, and undistorted representations of thoughts and feelings related to early attachments will impact upon her own caregiving skills and abilities (Slade, Belsky, Aber & Phelps, 1985).

The present study shares the assumption that the mother's ability to reflect upon, modulate, and integrate her own affective experience serves to organize infant and dyadic experiences (Slade, 1999). This, in turn, is believed to impact upon her representations of her child and of herself as a caregiver (George & Solomon, 1996; Slade, Belsky, Aber & Phelps, 1999).

Findings from the present study support other investigations that have undertaken to examine the association between parental representations and maternal quality of attachment. For example, Slade et al. (1999) determined that mothers' states of mind and representations of their attachment relationship with their toddlers was predicted by adult attachment status. Most important to the data at hand, the authors found that *positive affect* in relation to their children was associated with secure (autonomous) attachment.

As Slade (1999) has suggested, the ways in which secure mothers organize affective experience protects them against the dysregulation of the child's negative affects because the "vagaries of emotion are familiar to her" (p.581). Security of attachment has been shown in this case to involve the ability to regulate affect and to experience a full range of emotion, positive and negative (Cassidy, 1994). It may be in just this way that the secure autonomous mother is "sensitive to the meaning of emotion" (Slade, 1999, p.581).

Review of Maternal Sensitivity

Previous theoretical discussions have suggested only a partial understanding of how maternal sensitivity is linked to the transmission of attachment representations. For example, van IJzendoorn (1995) concluded that although the variable of *sensitive responsiveness* is "the traditional bridge between parents and children," it may be inadequate to explain the link between adult and

infant attachment quality. Van den Boom (1995) also determined that, overall, the empirical impact of maternal sensitivity on child outcome is modest. It was subsequently recommended that other domains of parenting behavior be explored in this context.

Furthermore, some authors have challenged the unidimensional models that often underlie the measurement of parenting qualities (Pine, 1992; van IJzendoorn, 1995), while others have raised questions about the criteria used to define such constructs as *maternal sensitivity* (Leyendecker, Lamb, Fracasso, Scholmerich, & Larson, 1997) and *maternal responsiveness* (van IJzendoorn, 1995).

Taking Ainsworth et al. (1974) as a point of departure, the original "index" of a mother's sensitivity was thought to be the *quality of her interactions* with the infant. This characterization also emphasized that the quality of the mother's responses "be *appropriate* to the situation and to the baby's communications" (p. 129). It is suggested here that quality of *appropriateness* should be contextualized by a number of factors, including developmental and situational ones. Taking these into consideration, it may be understood how maternal behaviors suitable or appropriate for normal interactions or interactions with younger infants, such as the provision of comfort or other types of affect-matching, -mirroring, or -attunement type of strategies (Stern, 1985; Stern, Hofer, Haft, & Dore, 1985), may be less effective in other situations or contexts.

Nevertheless, the findings from the present study appear to demonstrate that the quality of maternal sensitivity is not always determined by the engagement of comforting, soothing, or empathic displays, but is instead defined, in part, by the mother's ability to repair interactive disruptions sensitively and effectively and to transform negative into positive affect. On the basis of these findings, it is

proposed that in addition to any other measure of appropriateness, individual *styles of affective or emotional communication* (Main, Kaplan, & Cassidy, 1985) -- in terms of negative or positive distress regulation -- may serve to further delineate what is otherwise a more diffuse, global concept of maternal sensitivity.

Although potentially difficult to observe and measure empirically, the study of mother-infant dysregulation and distress reduction is a meaningful area of research that has unfortunately been neglected in the literature. It is hoped that this study offers preliminary evidence of the important contribution of these factors to the understanding of infant socio-emotional functioning and development.

Implications of the Study

This study supports the position that individual differences in maternal styles of affective communication impact upon infant socio-emotional functioning. While states of disruption and repair have been determined to occur normally in mother-infant interactions, (Tronick & Gianino, 1986), the implications of the findings presented here primarily concern clinical approaches and interventions in the face of chronic dysregulation and misattunement.

Many clinical interventions involving parent- or attachment-based modalities have been aimed at improving maternal sensitive responsiveness (see van IJzendoorn, Juffer, & Duyvesteyn, 1995, for a review). For example, van den Boom (1994) noted that infant self-reliance was best facilitated by relatively high levels of maternal responsiveness, without disproportionate overattentiveness or overstimulation.

In an earlier study, van den Boom (1988) also found that interventions

with mothers and their children were best directed at responsiveness, both negative and positive, and guided by "the stages of this response process, that is, perceiving infant signals, interpreting them correctly, selecting an appropriate response, and implementing it effectively" (van den Boom, 1989, p. 312).

Van IJzendoorn et al. (1995) performed a meta-analysis on the effects of attachment-based interventions on maternal sensitivity and infant security of attachment. Interventions were directed at either behavioral or representational aspects of attachment. These authors found that while interventions were effective in increasing parental sensitivity, they were less effective in changing children's quality of attachment or parental attachment representation. The authors concluded that interventions serving to directly enhance parental attachment representations may be more successful than other treatments in breaking the intergenerational transmission of insecure attachment.

This position is consistent with other theorists who have noted that changes in the mother-infant relationship may depend on parental revision of internal working models of representations of self and others as attachment figures (Bretherton, 1987; Slade, 1999). Central to this idea is the assumption that the way a mother views her relationships can be restructured with psychological insight (De Wolff & van IJzendoorn, 1997). This suggests that the intergenerational transmission of insecure attachment is avoidable, and that changes in organizational working models and internal representations are possible.

In another study, Bakermans-Kranenburg et al. (1998) found effects for short-term interventions directed at both the behavioral and representational levels of attachment experience and aimed towards increasing maternal sensitive responsiveness. These authors concluded that differences in attachment

classification were related to study effects, with dismissing mothers benefiting more from behavioral interventions, and preoccupied mothers profiting from the addition of attachment-related discussions about childhood experiences.

A number of points regarding clinical applications in the context of the present findings may be made. First, it is suggested that the variable *maternal sensitivity* be reviewed conceptually and empirically *prior to* applying it in practice, in order to take into account the specific qualities that characterize it. It is hoped that this study provides a first step in that direction.

Second, it is noted that many clinical interventions focusing on improving maternal sensitive responsiveness with or without restructuring internal working models of relationships have historically been offered on an individual, rather than a dyadic, basis. Nevertheless, while this approach may fail to address certain aspects of the mother-infant interaction, it is recognized that both individual and dyadic interventions have the potential of conferring some of the same benefits.

For example, an intervention with an empathic therapist may provide a "corrective emotional experience" (Alexander, 1925) for the mother, or a "secure base" (Bowlby, 1985) from which to explore her internal world. It may also present a forum in which to address and regulate negative affect (Cassidy, 1994), and offer opportunities to create realistic and coherent narratives of the mother's attachment relationships with both her parents and her children (Slade, 1999).

In his assessment of problems with caregiver emotional availability, Emde (1992) noted that a "lack of positive emotions may be a more sensitive indicator of problems than an excess of negative emotions" (p. 16). This speculation was based on his findings that normal, healthy dyads exhibited increasing levels of "positive affect sharing" by the end of their first and into their second year. These results

were in contrast to those of an at-risk population of infants of teen-age mothers, whose interactions were characterized primarily by negative affect sharing and the absence of positive affect sharing.

Third, on the basis of Emde's findings as well as those of the current study, it is suggested that clinical interventions be aimed at improving dyadic relationships, with a specific emphasis on increasing positively-toned interactions between mother and infant, and increasing interactions in which the infant is positively reflected in the eyes of the mother. This approach might include the provision of indirect guidance and support regarding the methods and strategies most likely to facilitate distress regulation and attunement, as well as the means by which intermediate and homeostatic levels of infant affect and attention may be best promoted. This latter condition is comparable to Field's (1981) concept of "optimal activation band" of arousal, affect, and attention, itself found to be associated with infant positive affect.

Fourth, and related to the previous point, it is suggested that specific dyadic mother-infant interventions be implemented, in the hope of modeling ways of transforming negative into positive affect and of encouraging self-regulation processes in both mother and child. Although this approach might emphasize other psychoanalytic, attachment, or object relational principals, including the interpretation of present experiences in light of the past, by endowing the therapeutic relationship with a scaffolding property of its own, this modality would stress the "embeddedness of the developing parent-infant bond within a network of regulating relationships" (Robinson et al., 1997, p. 60).

This conceptual shift from individual to dyadic interventions may be

viewed as the logical extension of the paradigmatic shift that occurred in the field of infancy research in the 1970's, in that it too serves to transform the study of the individual or the system's component parts to the study of dyadic properties.

Limitations of the Study

Although the findings of this study are preliminary and in need of replication, the Negative Affect Scale (NAS), Dyadic Repair (DR) measure, and Maternal Emotion Regulation Strategies (MERS) scale have proved to be reliable and valid instruments with which to measure infant, dyadic, and maternal variables. Nevertheless, a few limitations of the present study should be acknowledged. Most notable is its small sample size and sampling bias. These limit the overall power of the study and its generalizability to other groups of mothers.

It is also possible that the behaviors displayed during the still face procedure represent isolated rather than characteristic patterns of arousal and response. Furthermore, present findings could be explained by factors other than maternal emotion regulation strategies and dyadic repair. For example, a lack of interactive "goodness of fit" (Lerner, 1989; Thomas & Chess, 1977), or match between infant characteristics, such as temperament, and caregiving environment, might explain the failure of mother-infant pairs to achieve a condition of dyadic repair.

This might also be the case in terms of such factors as maternal depression (see, for example, Tronick & Weinberg, 1997) or infant neurophysiological disorders or delays (see, for example, DeGangi & Greenspan, 1988, 1989). In regard to the latter condition, Penman et al. (1983) have maintained that

physiological deficits are liable to underlie many of the disturbances observed in mother-infant interaction and attachment behavior. While these questions may warrant further investigation, they are nevertheless beyond the scope of the present study.

Recommendations for Future Research

Future research efforts might entail replication of the current study using a larger sample size, as well as the inclusion of a younger infant population. The addition of the latter group might help to evaluate the range of predictive values of maternal distress regulation and dyadic repair variables.

Another area deserving further attention concerns the inclusion of controls for maternal depression. This seems particularly relevant in respect to still face research, given that depressed mothers' capacity for repair has been recognized to be impaired (Tronick, 1989) and that negative affective states have been otherwise linked to the occurrence of maternal psychopathology (Cohn & Tronick, 1989; Tronick & Weinberg, 1997).

Furthermore, some authors have argued that maternal depression can yield more than one type of interactive pattern of caregiving, such as *intrusiveness* and *withdrawal* (Tronick & Weinberg, 1997), each of these patterns hypothesized to disrupt the infants' and dyads' regulatory processes in individual and unique ways. For example, infants of withdrawn mothers are hypothesized to have the least regulatory support from their mothers and would therefore be predicted to exhibit the greatest distress (Cohn & Tronick, 1988).

Other research has suggested that depressed mothers may attribute more negative intentions and motivations to their children than non-depressed mothers

(Teti & Gelfand, 1997). Such negative cognitive sets or representations may have subtle effects on the affective communications of mothers and infants, as well as on their attempts to repair interaction following situations of mismatch and interactive stress.

Thus, the inclusion of controls for depression might serve to strengthen or clarify the present findings. They might also provide useful information about the relative impact of these factors on socio-emotional development, and could offer interesting insights into the affective and representational worlds of mothers experiencing postpartum disorders.

A final area deserving further investigation is the study of maternal patterns of distress regulation and dyadic repair in relation to maternal attachment classification. With the use of an instrument like the Adult Attachment Interview (AAI), determination of this issue could provide a clearer understanding of working models of attachment relationships and the potential mechanisms by which these internal representations are transmitted.

Concluding Remarks

As noted by Tronick and others, the still face paradigm is a complex and multifaceted experience for mother and infant that "assesses the infant's relationship history with the mother" (Cohn, Campbell, & Ross, 1991, p. 368). In order to investigate the organizational pathways proposed to link maternal characteristics, dyadic repair, and infant regulatory and attachment outcome, the re-engagement episode of the still-face paradigm has proved a useful tool with which to measure affective states and the regulation of emotion.

Few studies have relied on objective, quantitative methods for assessing

individual differences in maternal responsiveness in the context of infant or dyadic distress. It is hoped that the development of the Maternal Emotion Regulation Strategies scale and the Dyadic Repair measure utilized herein, will provide additional insights into these processes. In the present study, the relative contributions of affect- and attention-regulating maternal strategies on the organization of infant socio-emotional development at 10-months of age was demonstrated. Differentiations between negative and positive affect-regulating responses were also made. These findings were interpreted in light of the developmental competencies of the older infant and the situation in which they were assessed.

Findings from this study offer preliminary evidence of the role that positive dyadic interactions and maternal styles of affective communication -- in terms of distress regulation -- play in influencing infant socio-emotional functioning, and suggest that the impact of maternal distress regulation and dyadic repair strategies on infant and adult attachment status merits further inquiry.

The effects of maternal unresponsiveness in relation to the infant may be interpreted in terms of the "meaning of the events to the infant and the communicative interactive process context in which they are embedded. Thus... the infants' affective displays form configurations that are related to the infants' affective states and to interactive contexts" (Weinberg & Tronick, 1996, p. 913). It appears to be precisely in the study of these affective configurations that insights about the development of self and self-organization, as well as those of the individual's relational world, are best revealed. Precisely how these configurations might be transmitted has been the subject of the present study.

Appendix A

Table 5
Interrater Reliability for Maternal Emotion Regulation Strategies
Training Tapes

Maternal Strategy	Intraclass Correlation Coefficient
Comfort	.99
Affect/State Comment (Negative)	1.00
Affect/State Comment (Positive)	1.00
Distract (Object)	.87
Distract (Maternal)	.67
Cognitive/Reason	.87
Overall Reliability	.90

Table 6

Interrater Reliability for Maternal Emotion Regulation Strategies
Still Face Tapes

Maternal Strategy	Intraclass Correlation Coefficient
Comfort	.98
Affect/State (Negative)	.95
Affect/State (Positive)	1.00
Distract (Object)	.97
Distract (Maternal)	.81
Cognitive/Reason	.94
Overall Reliability	.94

Appendix B**Table 7**

**Frequency and Percentage of Time (In Intervals) Spent in
Display of Negative Affect**

Number of Intervals	Frequency	Percent	Cumulative Percent
0	6	17.1	17.1
1	3	8.6	25.7
2	1	2.9	28.6
3	2	5.7	34.3
4	1	2.9	37.1
5	4	11.4	48.6
6	5	14.3	62.9
7	2	5.7	68.6
8	3	8.6	77.1
9	4	11.4	88.6
10	1	2.9	91.4
11	2	5.7	97.1
12	1	2.9	100.0
Total	35	100.0	100.0

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