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**Maternal representations of attachment and their relation to  
patterns of infant affect and maternal availability**

**Director, Lisa, Ph.D.**

**City University of New York, 1991**

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A

**Maternal Representations of Attachment  
and Their Relation to  
Patterns of Infant Affect and Maternal Availability**

by

**Lisa Director**

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.

1991

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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 REPRESENTATIONS OF ATTACHMENT AND THEIR RELATION TO PATTERNS OF INFANT AFFECT AND MATERNAL AVAILABILITY

by

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This study investigates the idea that differing organizations of attachment entail differing capacities to express and experience affect, communicated between caregiver and child. A parent's own representation of attachment is thought to drive this process of affect mediation, believed to emerge between parent and child at the end of the infant's first year of life.

Mothers and their 10-12-month-old infants were videotaped in a laboratory setting, in interaction with a mechanical toy robot. This stimulus aroused uncertainty and fear in the infants, creating conditions that invited mothers' guidance. The infants' affective responses to the robot, and the mothers' availability to their infants, were both assessed. These measures were examined in the context of maternal attachment. Mothers were classified as secure, dismissing, or preoccupied in relation to attachment, on the basis of the Adult Attachment Interview (George, Kaplan, & Main, 1985).

The findings support the hypothesis that flexible emotional life is a distinguishing feature of secure attachment. Infants of secure mothers produced the most flexible sequence of affective responses to the charged stimulus of this

paradigm. The content of the infants' affective responses also revealed important differences. Infants of both secure and dismissing mothers exhibited primarily positive responses to the robot, whereas infants of preoccupied mothers exhibited primarily negative responses. The prominence of anxiety in infants of the preoccupied group underscored the problematic role of negative affect in the dynamics thought to underlie insecure attachment.

On measures of maternal behavior, secure mothers exhibited consistent patterns of high availability in both physical and verbal interaction with their infants. In contrast, various analyses failed to produce findings of uniform behavior that could consistently distinguish the two insecure groups of dismissing and preoccupied mothers. These results suggest that secure attachment is a coherent and stable phenomenon, whereas insecure attachment seems to resist generalization, both as a single phenomenon or as two distinct subgroups, preoccupied and dismissing. The findings indicate the need for closer study of the tie between representation and behavior, in order to further understanding of adult attachment theory.

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In addition to the guidance I enjoyed from my committee, I benefited from the thoughts and assistance of various experts in the fields of infancy and attachment research. In particular I would like to thank Robert Emde, Alan Sroufe, Della Hann, Mary Klinnert, Diane Benoit, and Judy Crowell.

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## INTRODUCTION

A ten-month-old baby and her mother are engaged in playing with an assortment of toys. The child displays a steady, studious interest in the colorful books, balls, and stuffed animals around her. Occasionally she produces a clear grin, or punctuates her efforts with an energetic vocalization. But she otherwise lacks the emotional sparkle that we mythically attach to infancy. Her mother speaks of her with obvious caring and committed words, but at times her verbal accounts of their interaction also lack a "feeling" quality. At the conclusion of their play, this mother turns to a researcher and asks, in a clear expression of her concern, whether her daughter seems "quieter" than most infants her age.

In a sense, this study poses the same question as this mother: how is it that clearcut differences in emotional functioning already take shape by the age of ten months? Though some would seek a biological explanation through the vehicle of the child's own inborn temperament, there is also reason to believe that some mechanism in this mother's mediation of affect has been transmitted to her child, in the earliest months of their interaction with one another. Something is absent from the current of the mother's speech that is likewise missing from the current of her child's behavior. How does this happen? What intrapsychic vehicle might possibly transmit a parent's own affective biases and abilities to a young infant? According to recent research, internalized representations of attachment may well be the potent carriers in question, containing affective "rules" that reflect an adult's own attachment history, and that, in turn, shape an infant's emotional capabilities from the earliest days of life (Main, Kaplan, & Cassidy, 1985, pp. 66-67).

Attachment theory has not always been so concerned with affect, or with the influence of mothers' own inner lives on the shaping of their infants' characters (Haft & Slade, 1989). To be sure, it is precisely these contemporary trends that have

made the attachment construct so meaningful to clinicians. To understand the tenets of contemporary attachment theory, and the niche occupied by the present study, it is necessary to briefly review attachment and other theoretical developments within the past three decades.

The attachment construct has undergone enormous revision since it was first introduced by John Bowlby in the 1950's as an alternative to drive theory. Bowlby's (1969, 1980) observations of the young, in both the animal and human worlds, led him to believe that they shared an evolutionary need to fashion, from birth, a system of behaviors designed to ensure connectedness to their caregivers. Bowlby's descriptions of the workings of this system, including the part played by the "internal working model" that the infant forms of the world around him, gave attachment a clear place in developmental theory from the start. But Bowlby's conception, in its biobehavioral emphasis, did not issue as clear a mandate to clinical theorists at first.

That was left to Mary Ainsworth and to Mary Main. In a landmark study, Ainsworth developed the Strange Situation, an experimental paradigm that permitted her to study the separation and reunion behaviors of one-year-old infants. Ainsworth found that clear patterns of behavior differentiated the infants, seen most powerfully in their responses to their mothers after a sequence of brief separations (Ainsworth, Blehar, Waters, & Wall, 1978). Her telling portraits of one-year-olds coolly ignoring their mothers, or controlling interaction through insistent clinginess, served a number of purposes. The data made clear that attachment was not only a means of mediating current mother-infant interaction, but a process that deeply colored overall functioning - in ways that were already apparent by the age of 1! Her portraits of these infants commanded clinical attention because they were so rich in emotional and psychological implications, and because they seemed to provide antecedents of familiar forms of adult behavior.

If, however, Ainsworth's observations were still primarily about behavior, the work of Mary Main served to remove attachment from the realm of the behavior sciences, and bring it into close alignment with psychoanalytic and object relations theories (Bretherton, 1987). Main further opened up attachment thinking to clinicians, by recasting concepts in intrapsychic terms. She saw the internal working model as "a set of conscious and/or unconscious rules for the organization of information... regarding attachment-related experiences, feelings, and ideations" (Main et al., 1985, pp. 66-67). Main's formulations made the attachment construct as central to an understanding of adult intrapsychic functioning, as it had previously been to a conception of infancy. In fact, Main and her colleagues developed the Adult Attachment Interview (George, Kaplan, & Main, 1985), to see whether an adult's "state of mind" regarding attachment experience might reveal itself in patterns of recollection and verbal expression that matched the behavioral indices of infant attachment (Main & Goldwyn, in press). Such work linking adult and infant expressions of attachment in turn led to the current avenue of attachment research, as investigators are now exploring the ways in which representations are transmitted from parent to child (Haft & Slade, 1989). The present study is an outgrowth of current efforts to chart the generational journey of attachment-related feelings and beliefs - from maternal representation to infant representation, from infant representation to infant behavior.

During the same three decades that gave rise to contemporary attachment theory, ferment of equal magnitude was taking place in the field of infancy research. Drive theorists' long-standing notion of the infant as passive, barely alert, and motivated only by drive reduction was being overtaken by a view of the infant as active, involved in seeking stimulation, and engaged in interaction from birth (Emde, 1980). Alongside these theoretical currents, a revolution in technology made it possible to do sophisticated observations of infants from birth. These advances

brought new insights into infant development. Though at first the relatively quiet 10-12 month stage was eclipsed by the "showier" gains that came before and after it, this era of life is now under close scrutiny.

Researchers now believe that the end of the first year is a period of intense, internal expansion, not dramatically apparent to the outside observer's eye. They believe that it is during this time that the infant attains an awareness of his own and others' subjective experience, primarily feelings, and comes to a realization that people's inner lives are shareable (Stern, 1985). Affect has always been considered the language of infancy (Emde, 1980). Now, researchers say, this special communication system comes into effective operation at the end of the first year. Evidence of this achievement can be seen in the very phenomenon of "social referencing" - a process in which an infant seeks emotional information from a caretaker, in order to better appraise the meaning of an ambiguous stimulus (Emde, 1983; Klinnert, Emde, Butterfield, & Campos, 1986). It is a preverbal form of communication, with affect serving as the medium. Researchers find that it becomes prominent when infants are about one year old.

Bridging these recent developments in attachment theory and in the study of infant affect, is the contemporary work of Roger Kobak. Kobak places affect, in particular negative affect, at the heart of his explanation of secure and insecure attachment (Kobak, 1987; Kobak & Sceery, in press; Kobak & Shaver, 1987). To him, a secure dyad is one in which an infant feels confident that his expressions of fear and distress, as well as of positive affect, will meet with understanding by his caregiver. An insecure infant, on the other hand, finds that expressions of negative affect are unmanageable to his parent. He therefore learns to "cut off" (Kobak & Shaver, 1987, p. 14) feelings of neediness and upset, or, at the other extreme, becomes flooded by these feelings in a desperate attempt to gain a response. Either

way, the insecure infant is prevented from expressing a full or balanced complement of feelings.

Thus, central to Kobak's conception of secure attachment is the capacity for emotional flexibility: the infant is able to feel and express a broad range of positive and negative emotional experience, under the tutelage of a caregiver who can "hear" and validate, for her child, an entire inner world. To the list of restrictions that insecure attachment imposes on a person's capacity for attention, exploration, and memory, Kobak adds the particularly crippling limitations it imposes on emotional functioning as well. His insecure individuals, both infants and adults, negotiate the world through a narrow band of the potentially rich emotional endowment available to them in life. It is precisely this aspect of insecure attachment, its pervasive emotional cost, that bears most relevance to clinicians.

Thus, somehow encapsulated in the representations of attachment that a parent passes on to a child are powerful messages that shape the child's emotional capabilities. A set of new questions arises, in studying mother-infant transmission of attachment: is the child given authorization and encouragement to "feel" all ways? Is the child taught to greet new experience with a broad and flexible array of emotional resources, or to venture forth with only a limited repertoire of feelings to guide him? Are fear and anxiety treated as insurmountable burdens of being human, to be reckoned with only by denial or surrender? Or is negative affect given its due, but evaluated in the context of a larger emotional life, that includes, in equal measure, the possibility of interest, humor, and joy? These are the questions suggested by Kobak's theoretical treatment of the relationship between attachment and affect. They underlie the inquiry of the concerned mother, quoted at the outset of this paper. They are the questions undertaken for empirical study in the present project.

### Statement of Purpose

This study is part of a longitudinal project investigating attachment in mothers and their first-born infants. When the infants are 10-12 months old, they are videotaped in play interactions with their mothers. At the conclusion of a segment of free play, a battery-operated robot is introduced to the playroom, and turned on by the experimenter. Its noisy, flashing mechanics arouse uncertainty and some apprehension in the infants; the possibility that they may turn to their caregivers for affective guidance is thus created. The affective responses of the infants to the robot, and the mothers' availability in this situation, are the subject of this study, and will be examined in the context of attachment.

This experiment expands traditional research on social referencing, by creating an opportunity to study a more spontaneous version of the process than is ordinarily studied. Although the robot is artificially introduced into mother-infant play, the mothers are not instructed to "pose" particular emotional responses to it, as they customarily are in social referencing paradigms. Rather, it is believed that mothers will draw on their own internal "rules" for mediating anxiety, and for making meaning out of novelty for their children. Stated another way, this situation calls on the mothers to exercise the very set of feelings, beliefs, and abilities that constitute their particular constellations of attachment material. We set the representation of attachment in motion, as it were, and see where it takes this particular set of mothers. For their part, the 10-12 month-old age group is selected for this study because it is believed that at this age, as previously discussed, infants become effective emotional partners in interaction.

Principally, this study seeks to enhance the understanding of the intimate connection between attachment and affect. Conditions exist here to study the natural responses of mother-infant dyads to a difficult, though not impossible,

emotional challenge. This experiment replicates, in microcosm, the kinds of simple mother-infant interactions that take place in a developing child's life each and every day, and through which he is introduced to the wider world around him. Whether that new experience takes the form of a new toy, or a newborn sibling, or an unfamiliar potty seat, or a first day at nursery school, all such experience needs to be funneled through the same affective system of mother-child interaction as is under examination here.

In the following pages, it will be argued that there is a strong relationship between maternal and infant representations of attachment, carried over and expressed in infant behavior. In this study, it is believed that mothers' representations of attachment will be seen to have an effect on their infants' affective responses to the robot. It is believed that this effect exists independently of the infants' own temperamental characteristics. Specifically, it is suggested that infants of securely-attached mothers will express greater flexibility in their affective responses than infants of insecurely-attached mothers. The latter will not only demonstrate clearer restrictions in their emotional responses; negative affect will be heightened or muted in their reactions. Similarly, secure mothers will demonstrate more flexible patterns of availability than insecure mothers.

In summary, the questions posed by the present study are:

1. How does the mother's own attachment organization predict to the flexibility of her child's affective responses to an unknown stimulus?
2. How does the mother's attachment organization predict to the quality of her own availability, in the face of her child's encounter with an affective challenge?

## CHAPTER ONE

### Literature Review

The review of the literature is organized into three main sections. In the first, attachment theory will be traced, from its earliest formulations by John Bowlby and Mary Ainsworth, to the more contemporary elaborations of Mary Main and Roger Kobak. The present study can be viewed as having a place within both generations of attachment theory. The infant's ability to mediate his bond to his mother and his interest in the world "out there" - represented by the robot - can be viewed from the ethological perspective of Bowlby, or from the vantage point of the "secure base" phenomenon that Ainsworth et al. (1978, p. 22) described for us.

Yet, the present study most strongly stems from current theories about the special role of affect, in particular negative affect, in shaping the attachment relationship (Kobak, 1987; Kobak & Sceery, in press; Kobak & Shaver, 1987). Through this focus on affect, it is hoped that this study will enhance understanding of the process by which representations of attachment are transmitted from parent to child (Haft & Slade, 1989; Main & Goldwyn, in press). Finally, at the end of this section, various criticisms of attachment theory will also be presented.

In the next section of the literature review, a body of theories that address the developmental achievements of the end of the first year will be discussed. The effect of recent thinking about this age is to make the 10-12 month-old infant a more fully functioning autonomous individual, and a more fully realized psychological partner, than had been previously believed.

Lastly, the literature on social referencing will be reviewed. The present study deviates from standard social referencing experiments in important ways that will be explained here.

Within each section, both theoretical and empirical research will be reviewed.

## I. Attachment Theory

### A. The Early Work of John Bowlby and Mary Ainsworth

In a departure from psychoanalytic theory, John Bowlby (1969, 1980) conceived of the attachment system as a way of explaining the particular anxiety and distress that he observed in young children when they were separated from their mothers. To Bowlby (1969), the power of the mother-infant bond could not be adequately explained by a theory of secondary drive - that is, the idea that the baby becomes attached to the mother because it is she who gratifies his physiological needs. Rather, Bowlby borrowed from the disciplines of ethology and control theory to propose that human beings, like the animals around them, had, over time, evolved a network of instinctual behaviors to guarantee protection of their young and survival of the species.

As Bowlby explains it, the attachment system first grows out of a number of simple behaviors - for example, sucking, clinging, following, crying, and smiling - that early on in an infant's development, become organized around the "set-goal" of achieving proximity to mother (Bowlby, 1969). Though contact with the caregiver is the seeming objective goal of the attachment system, later theorists have pointed out that the goal, to the attached person, is a subjective experience of "felt security" (Bretherton, 1987, Sroufe & Waters, 1977). Certain conditions in the child, caregiver, or environment lead to the "activation" of attachment behavior. For example, if a child feels tired, hungry, or ill, if his caregiver is departing or absent, if the environment feels threatening or unsafe, the child is likely to seek proximity or contact with a significant other. Likewise, if the environment feels stable and

familiar, and the caregiver reliably present, attachment behaviors can be "terminated," and their counterpart, exploratory behaviors, initiated.

There is a heavy emphasis on cognition in Bowlby's concept of a "goal-corrected" attachment system: even the young infant is busy appraising signals from his caregiver and his environment, and effecting purposeful strategies to modify and achieve set-goals. However, the infant does not appraise the relative safety or danger of his position in the world, anew each time (Bretherton, 1985). Rather, by the end of the first year, the infant begins to construct the beginnings of an "internal working model" of the caregiver, self, and the relationship between the two, that help him to guide his behavior and know what to expect in the world. Figuring into such models of self and other is the record of the infant's actual experiences with his caregiver to date, and the degree to which he has come to confidently expect her to respond to his bids for attention and nurturance. Though Bowlby (1969) says that internal working models are "none other than the 'internal worlds' of traditional psychoanalytic theory, seen in a new perspective" ( p. 82), his own emphasis is, again, decidedly cognitive. His models enable the infant to conduct "small-scale experiments" ( p. 81) in his head, that permit him to predict the probable outcomes of his own and his caretaker's behavior. Bowlby believes that as the infant's representational capacities develop, in the second year of life and after, the attachment system becomes bicameral, and operates both on a behavioral and ideational level (Bretherton, 1985). The attachment system, with both its domains, remains active throughout the individual's life.

Mary Ainsworth advanced the research into attachment by elaborating Bowlby's theories, and contributing a far-reaching empirical step of her own (Aber & Slade, 1987). Ainsworth took pains to distinguish between terms that Bowlby had left unclear. For example, to her, observable attachment "behaviors" only pointed to the more important, underlying attachment "bond" that existed between mother and

child (Ainsworth et al., 1978, p. 17). To examine the differences in the quality of the mother-infant bond, Ainsworth designed a classic, experimental paradigm known as the Strange Situation (Aber & Slade, 1987).

This procedure takes place in a playroom, and consists of eight, three-minute episodes that guide a one-year-old infant through a series of stresses and separations that culminate in his being left alone, before being reunited with his mother. Surprisingly, it was the reunion behavior of the infant towards the mother that proved to be the most compelling piece of the data. The angry "snubs" of some infants towards their mothers, and the eager, open-armed responses of others were, to Ainsworth, revealing snapshots that seemed to contain the histories of different mother-infant relationships throughout the first year of life. From this experimental data, Ainsworth et al. (1978) fashioned three basic "typologies" of infant attachment behavior. The categories, and their characteristics, are summarized below:

"B" baby - "Secure"

- Seeks proximity and contact with the mother, especially during reunion
- Is more interested in interacting with his mother than with the stranger who plays a part in the experimental procedure
- Is distressed during separation because of the mother's absence, not because of being alone

"A" baby - "Insecure"/"Avoidant"

- Avoids proximity to the mother during reunion, by ignoring her, averting gaze, etc.
- Tends to treat the stranger like the mother
- Shows little distress during separation

"C" baby - "Insecure"/"Resistant" (initially called "ambivalent")

- Seeks proximity, but also resists contact and interaction
- Exhibits maladaptive behavior elsewhere in the procedure, including little exploration of the environment

Ainsworth's findings provided powerful confirmation of Bowlby's notions about internal working models. Her one-year-old subjects had already formed clear expectations of their mothers' responses, that seemed to guide their behavior and expression of need during the reunion episodes. Secure babies welcomed their mothers' return, and went to them directly for comfort. Avoidant babies turned away from their mothers, in gestures of seeming reproach. Resistant babies seemed to be in conflict, and while both approaching and resisting their mothers, failed to be easily soothed. What had led to these differences? Ainsworth was able to draw strong correlations between infant attachment classifications in the Strange Situation and maternal behavior towards their infants in the earliest months of life, through her home visits and observations of twenty-six mother-infant dyads. She found that the most important aspect of maternal behavior that served to determine the quality of an infant's attachment at the age of one year was "sensitive responsiveness to infant signals and communications" (Ainsworth et al., 1978, p. 152). She explains:

The optimally sensitive mother is able to see things from her baby's point of view. She is alert to perceive her baby's signals, interprets them accurately, and responds appropriately and promptly, unless no response is the most appropriate under the circumstances. She tends to give the baby what he seems to want, and when she does not she is tactful in acknowledging his communication. Furthermore, she makes her responses temporally contingent upon the baby's signals. (p. 142)

Ainsworth et al. (1978) found that, as early as the first three months of life, mothers of babies who would later be rated secure had been sensitively responsive to their infants' signals; mothers of resistant babies had been unpredictably responsive; and mothers of avoidant babies had been insensitive to their infants' cues and rejecting of their bids for physical contact. Mothers of avoidant babies were also found to lack emotional expressiveness. Strikingly, however, Ainsworth et al. found that most mothers seemed to have the interpersonal skills required to nurture

security in their infants, since 65-70% of the infants tested in the Strange Situation were found to be securely-attached.

Although both Bowlby and Ainsworth developed the role of internal working models as the foundation of the attachment system, their respective contributions actually gave early attachment theory an emphasis on behavior. Together, Bowlby's adherence to an ethological model, and Ainsworth's portraits of prototypal responses to separation and reunion, lent more life to attachment as an external rather than an intrapsychic phenomenon. In fact, as Sroufe pointed out in his own early elaborations of the attachment construct, critics often charged that attachment was nothing more than another name for dependency (Sroufe, Fox, & Pancake, 1983; Sroufe & Waters, 1977). Viewed as such, it could be seen, simply, as a trait, as if it were "a thing residing in the infant in some amount" (Sroufe & Waters, 1977, p. 1184), whose relative strength could be observed and measured by a number of simple behaviors like touching, looking, approaching, crying, etc. If viewed in a more relational context, attachment could still be seen as referring simply to the strength of mother-infant interaction, as if it were measurable on a continuum from "more" to "less" (Sroufe et al., 1983; Sroufe & Waters, 1977).

Even setting such criticisms aside, attachment theory seemed to have to overcome the obvious, if the construct were to become more far-reaching in its implications. The very name, attachment, foretold the dilemma, conveying at once the unique pull and traction of the bond under discussion, but also its most obvious and elementary premise: "when people are attached to another, they want to be with their loved one" (Ainsworth et al., 1978, p. 14). True, of course, but what is the value of this as a developmental paradigm? The attachment construct had to be expanded, not only in name alone: other areas of intrapsychic functioning, outside of the separation process so central to Bowlby's and Ainsworth's conceptions, had to be meaningfully integrated into attachment theory. For, evaluated in the light of

more all-encompassing theories of development like Margaret Mahler's (Mahler, Pine, & Bergman, 1975), and, more recently, Daniel Stern's (1985), early attachment theory seemed one-dimensional.

### B. The Shift to Representation: Mary Main

Mary Main, and contemporary researchers who have followed her path, broadened the meaning of attachment considerably by shifting the investigation away from behavior and into the domain of representation (Aber & Slade, 1987). Main et al. (1985) conceptualized individual differences in attachment organization - the secure versus insecure patterns - as different types of internal working models of self in relation to attachment. They lifted the discussion of attachment to another level entirely, by offering this new definition of the internal working model:

... a set of conscious and/or unconscious rules for the organization of information relevant to attachment and for obtaining or limiting access to that information, that is, to information regarding attachment-related experiences, feelings, and ideations. (pp. 66-67)

Main et al. added that in their reconceptualization, such internal working models "direct not only feelings and behavior but also attention, memory, and cognition, insofar as these relate directly or indirectly to attachment" (p. 67).

Main thus transforms the internal working model into a more far-reaching, intrapsychic phenomenon - linking idea, affect, perception, and behavior - than was suggested by Bowlby's (1969) more workmanlike "cognitive map." In fact, her redefinition brings the model more in line with psychoanalytic concepts of internalization, although important differences exist (Aber & Slade, 1987). The internal working model is seen as dynamic, and open to present and future change, rather than as static and reflective of past experience only (Aber & Slade, 1987). Even more importantly, the internal working model is always set in a relational

context. In fact, many believe that the internal working model actually reflects a relationship, not an individual, and a particular relationship, too. Here, Main borrows Hinde's (1982) idea that reunion responses, and hence the internal working models underlying them, can be seen as indicating the infant's "view" of his relationship, with a particular caregiver, at a particular point in time.

Main's reformulation of attachment in terms of representation enabled her to open up the study of the process to adults, and to consider the possible role of language. To do this, Main and her colleagues developed the Adult Attachment Interview (George et al., 1985), a structured clinical interview administered to adults to elicit their memories, thoughts, and feelings about their own attachment histories. Main first gave the interviews to a set of parents whose children, five years earlier, had been evaluated as infants in the Strange Situation.

Main and Goldwyn (in press) reported that they found differences in the adults' organization of their own attachment narratives, and their access to feelings about their early lives, that paralleled their infants' behavior in the Strange Situation five years earlier. Main and Goldwyn identified three classes of response to the Adult Attachment Interview. Adults rated "secure/autonomous" valued their attachment relationships. They presented "coherent" accounts of their early lives. It was not so much that they had managed to escape hurtful experiences as children. Rather, these individuals had access to both positive and negative memories and feelings, and both aspects of their experience had been integrated into a well-thought-out understanding of their lives. Adults rated "dismissing of attachment" devalued their attachment experiences. Their narratives were marked by a particular kind of "incoherency" - namely, a seeming split between their semantic generalizations about their early lives, and the episodic memories they cited. For example, a portrait of a loving mother could be contradicted by an instance of remembered cruelty. Dismissing adults also said they could not remember aspects

of their lives, or otherwise omitted information. Finally, adults deemed "preoccupied with attachment" also gave incoherent interviews. They, however, did not suffer from a lack of recall, but a seeming inability to conceptually organize their responses, or disentangle their web of conflicted feelings towards their parents. Though parents themselves, they still seemed enmeshed in their families of origin.

Main and Goldwyn found strong correlations between infant attachment classifications, assessed through the Strange Situation, and parental classifications, assessed through the Attachment Interview. Parents of infants who had been rated secure were likely themselves to be secure/autonomous; parents of avoidant infants were likely to be dismissing of attachment; and parents of resistant infants were likely to be preoccupied with attachment.

Main's groundbreaking work with the Adult Attachment Interview led her to refine her understanding of the nature of the intrapsychic process under examination in attachment studies. She felt that her three organizing labels - secure, dismissing, preoccupied - referred to an adult's "state of mind" with respect to attachment (Main & Goldwyn, in press). She chose this term to replace "internal working model" because she felt that the latter designation applied to a model of a particular individual or relationship, whereas her term conveyed an individual's "apparent overall condition with respect to his or her attachment history in its entirety" (p. 3). In making "mental states" (p. 22) the new object of study, Main begins to "get at" the intrapsychic referent that attachment behaviors only alert us to, in a way that her predecessors hinted at but did not approach. Main's reframing permits her to establish an all-important "state-to-behavior link" (p. 25) in the study of attachment. With security and insecurity conceived as different kinds of "mental organizations" with respect to attachment - the former, inclusive, and the latter, restrictive - any attachment cues "originating externally (from the infant) and internally (from memory) may be similar in the reactions they evoke" (p. 24). Thus,

for an adult (dismissing) who needs to block any activation of thought or feeling relevant to attachment, both her own memories of neediness as a child, and her own infant's calls of distress evoke the same defensive response. Lack of recall in an interview, and actual insensitivity to her infant's signals, though expressed differently, are essentially twin results.

Though "state of mind" is a somewhat diffuse term, it does free the attachment construct from the foregoing concreteness of the internal working model, and makes of attachment a more subjective, reflective, and felt experience. Again, Main's conception permits the forging of closer links with psychoanalytic theories. For example, the following are excerpts from Schafer's (1968) description of internalized object representations, whose themes are echoed by Main:

Object representation refers to certain contents of subjective experience. It may be defined as an idea that the subject has about another person, creature, or thing.... The object representation may pertain to aspects of another person's body or his personality. It may be pitched on any level of abstractness. Large-scale representations of an object include small-scale ones.... Object representations are always involved, at least by implication, in feelings about, and attitudes toward, the other person and one's own person. (p. 28)

Although attachment theory has always rooted representation in the actual circumstances of mother-infant interaction, Main's suggestion that representation be construed as "current state of mind" opens the door to the possible consideration of fantasy, distortion, and wish - long the comfortable domain of psychoanalytic thinkers. Though attachment, from its outset, has always had a place within developmental theory, these new inroads into the understanding of attachment as an internal, subjective attitude and feeling have given attachment theory far-reaching clinical significance as well.

Mary Main advanced the inquiry into representation; Roger Kobak extended the understanding of affect.

### C. The Role of Affect: Roger Kobak

Bowlby (1969) himself stated that "no form of behavior is accompanied by stronger feeling than is attachment behavior" (p. 209). In particular, he highlighted the importance of feelings of security, anxiety, and anger in the attachment process. Yet, because Bowlby placed feelings under the larger rubric of "appraising processes" (p. 104), the role of affect was again obscured by his cognitive bent.

The overshadowing of affect by cognition, however, was typical of most developmental theory until fairly recently. As Bretherton (1987) points out, at the time of Bowlby's original writings, there was little research into infants' internal, affective experience. However, there has been an explosion of empirical research into infancy in the 1970's and '80's, largely facilitated by the advent of videotape. With it has come a more focused inquiry into infants' psychological and emotional life. Thus, contemporary attachment theorists grant a much more pivotal role to affect. For example, Sroufe and Waters (1977), in offering their "organizational" view of the attachment construct, select "the affective bond" (p. 1186) between caregiver and child as the central, defining feature of attachment. It is this affective bond, they say, that gives meaning to the many heterogeneous features of the attachment system - that is, the experience of distress during separation, the seeking of proximity to preferred figures, the feeling of security in the presence of those figures that, in turn, promotes exploration.

Most recently, Roger Kobak has greatly expanded our understanding of the workings of affect within the attachment system (Kobak, 1987; Kobak & Sceery, in press; Kobak and Shaver, 1987). Like Main, Kobak finds Bowlby's concept of the internal working model too thin and abstract to explain the nitty-gritty of how

individuals organize attachment behaviors and feelings, and how variations of attachment experience work their way into enduring personality organization.

Kobak and Shaver (1987) propose that we view attachment processes as "different strategies for maintaining felt security during times of stress" (p. 4). Central to Kobak's view of the attachment relationship is the experience of negative affect. That is, Kobak feels that the attachment relationship is founded on the child's experience of fear and distress, of anger when his needs for love are frustrated, and of anxiety about the availability of his caretakers. Thus, to Kobak, the quality of the attachment relationship is determined by the dyad's processing of negative affect, seen in the infant's capacity to express his distress and fear, and the caregiver's capacity to tolerate and accept these communications, in reply.

Kobak transposes the three prototypal attachment classifications into these terms (Kobak, 1987; Kobak & Sceery, in press; Kobak & Shaver, 1987). The secure parent is able to acknowledge her child's expression of negative affect as indicative of understandable attachment needs. The child of such a parent comes to experience his caregiver as sensitive and available during times of stress. On the other hand, a dismissing parent experiences her child's expression of need as irritating and intrusive, and perhaps as something the child could restrain himself from if, in layman's terms, he would only try harder or make himself grow up. Within the context of this relationship, a child comes to expect rebuff and resentment in response to his expression of attachment feelings. Finally, the preoccupied parent is still searching for security herself, and, as Kobak and Shaver point out, might even view the child as a potential source of comfort. Unable to quell her own anxiety, such a parent resents her child's need for support, yet, at the same time, feels guilty for failing to adequately fulfill his needs. These conflicting responses might lead a child of such a parent to build a working model of her as inconsistently available.

The beauty of Kobak's conception is that it illuminates the way in which representations of self and other are inextricably linked. The various parental responses to attachment feeling present the child either with successful outcomes, or with dilemmas regarding his expression of negative affect, that then influence the child's "style of emotional communication" (Kobak & Shaver, 1987, p. 5) profoundly. The child of a secure caregiver, himself secure, "adopts a strategy of openly displaying attachment behavior and feeling" (p. 13), confident that such expression will be accepted. The child of a dismissing parent himself learns to "dismiss" or "cut off" (p. 14) direct expression of attachment feeling, in an effort to forestall rejection. This is the emotional current at work underneath the outward "snubs" that avoidant infants direct towards their mothers in the Strange Situation. Finally, children of preoccupied caregivers themselves "adopt a strategy of preoccupation" (p. 14) with attachment feelings. Their high-pitched displays of difficulty arise out of an effort to ensure some response from an inconsistently available parent, whose own anxiety they need to outdo in order to merit attention. These are the forces underlying the demanding clinginess seen in resistant or ambivalent infants.

Kobak and Shaver construct a staircase of interconnected attributes that flow out of these initial strategies, and that become stable features of personality organization. They believe that each strategy sets in motion a characteristic way of responding, consisting of a style of emotional communication, a dominant affect, defensive tendencies, and beliefs about self and others, which, taken together, suggest the beginnings of character formation. To briefly summarize their thinking: the secure child learns to be open to the experience of negative affect, and turns to others directly and without conflict to communicate his feelings. He conveys a sense of confidence and self-worth in his engagement with the world. The avoidant child learns to cut off or minimize the experience of negative affect, and seeks refuge from the frustrations of intimacy in the inanimate world of play and work. Such a child

conveys anger over unmet needs, that often finds displaced expression in other forms of aggression. He may guard against the pain of unrequited neediness by building a false sense of himself as independent and self-reliant. In contrast, the preoccupied child is overly reactive to fearful stimuli, and often seems swarmed by negative affect. However, lacking an effective route to resolution, such a child experiences unchecked anxiety, and eventually acquires a sense of himself as inadequate and helpless.

How convincingly these portraits are drawn by Kobak and Shaver, and how true to clinical life their hypothesized individuals feel. They capture the boundary confusion and competition for comfort familiar in preoccupied dyads; the choked-off feeling and undertow of hostility in dismissing dyads; and the democratic exchange of all feeling in secure dyads. It is as if, in Kobak's formulation of attachment and personality formation, insecure individuals are confined to a single octave of affective experience - different in the two forms of insecure attachment, though equally limited - while only secure individuals have the capacity to experience and exchange a full range of emotional life.

A recent empirical study of the relationship between infant attachment and affect lends support to these ideas. Hann, Osofsky, Stringer, and Carter (1988) assessed 13-month-old infants for quality of attachment in the Strange Situation, and also rated the infants' discrete affect and global hedonic tone throughout the first five episodes of the experimental procedure. Hann et al. found a high incidence of negative, and a low incidence of positive affect in resistant infants; a reverse pattern of "high positive and low negative affect" (p. 8) in avoidant infants; and a pattern of "moderation" (p. 10) of both positive and negative affect in secure infants. Similarly, mothers of resistant infants tended to show the highest levels of negative affect in exchanges with their infants; mothers of avoidant infants tended to show the lowest levels; and mothers of secure infants were marked by moderation. The authors

concluded their report by suggesting that future research explore "the affective contributions of mother and infant in other socially relevant situations beyond the attachment paradigm..." (p. 13).

The present study proposes to do exactly that. Using Kobak's rich, theoretical formulations as guiding principles, the present study seeks to examine the "affective contributions" of mother and infant in the social referencing paradigm that emerges at the end of the first year, and that typifies the 10-12 month-old's newfound ability to incorporate a wider array of the stimuli around him. As a powerful and unfamiliar stimulus, the robot arouses anxiety, and thus creates the conditions for observing the negotiation of negative affect between mother and child. This study extends the ground covered by Hann et al. in another important respect: it is the mother's quality of attachment, rather than the infant's, that is the predictor of interest here. For, as Main has recently shown us, it is the tie between maternal representation and infant behavior that commands closer study, and at this point holds the greatest promise of producing further insights into the workings of attachment.

#### D. Criticism of Attachment Theory

Before concluding this account of the evolution of attachment theory, it is important to acknowledge the often-critical reception that has greeted it through the years. In fact, for a theory often faulted for the very obviousness of its tenets, it is striking how ardent the opposition has often been. Challenges to attachment theory have been along two related lines, empirical and theoretical, and both will be briefly summarized here.

Criticisms of the empirical underpinnings of attachment theory have centered on Ainsworth's Strange Situation, for it is this experimental procedure that

introduced the tripartite model of "secure," "avoidant," and "resistant" variations in individual behavior that remains a cornerstone of the attachment paradigm. In their extensive review of the literature concerning the Strange Situation, Lamb, Thompson, Gardner, Charnov, and Estes (1984) concluded that "strong claims regarding the antecedents, interpretation, temporal stability, consistency, and predictive validity of Strange Situation behavior are only partly supported by the empirical and theoretical literature" (p. 145). Lamb et al. drew attention to several methodological issues concerning Ainsworth's work (for example, her lack of adequate assessments of reliability in the home observations and lab procedures) that, in their view, gave her work the quality of a "hypothesis-generating pilot study," rather than a "hypothesis-testing investigation" (p. 131). They argued further that: evidence was insufficient to conclude that infant behavior in the Strange Situation was predicated on caregiver responsiveness earlier in the relationship; attachment classification was not always stable across time, so the Strange Situation actually measured the "current" rather than "enduring" (p. 136) status of the mother-infant relationship; the predictive validity of Strange Situation classifications was not based on the power of early attachment experiences, but on the continuity of parental care at each new stage of the child's development. They also questioned the wisdom of relying on a single twenty-minute experimental procedure to assess behavior whose complexity could perhaps better be captured in a range of settings and conditions. The very artificiality of the Strange Situation, ironically reflected in its name, has prompted other critics as well to question its usefulness in reaching conclusions about real-life mother-infant interaction (Chess & Thomas, 1982a; Kagan, 1984).

But Sroufe and Waters (1982) challenged this perception of the Strange Situation as a contrived lab procedure by pointing out that Ainsworth developed it on the basis of patterns of behavior she first discovered through home observations of

real-life mother-infant interaction. In reply to Lamb et al.'s other methodological criticisms, other attachment researchers upheld the use of the Strange Situation by arguing that science required a genre of "discovery research" as well as a more rule-bound "proof research" (Grossmann & Grossmann, 1984, p. 155), to oversee the different steps required to first detect and then formally establish new scientific principles.

But one of Lamb et al.'s central criticisms was harder to rebut. They concluded that the only differences that attachment studies could reliably uncover were between securely and insecurely-attached infants, and that further group distinctions were invalid. Their studies had turned up a lack of sufficient distinction between "A" and "C" groups, a particular lack of coherence in the "C" group, and considerable lack of clarity among the various subgroups. Thus, Lamb et al. denounced the A, B, C classification system as an "artificial trichotomy" (p. 135), and challenged Ainsworth and her colleagues to "demonstrate that the existing categorical system provides a better means of assessing infants than continuous dimensions would" (p. 145).

In fact, attachment researchers themselves have repeatedly encountered difficulties applying a categorical system to adult as well as infant subjects (Main & Goldwyn, 1988; Main & Weston, 1981). Subjects have sometimes proven impossible to classify, or have elicited forced classification into ill-fitting categories (Main & Goldwyn, 1988; Main & Weston, 1981). Attempts to sharpen the original classification by considering a fourth category (for both infants and adults) have not dispelled the charge that, in their overly neat nosology, attachment theorists are trying to "get at" complex behavior and intrapsychic processes in the wrong way. If anything, it is this reductionist reliance on a possibly inadequate categorical system that has undermined the appeal of attachment theory to clinicians.

The charge of "oversimplification" has been leveled at attachment theorists quite apart from their empirical efforts and approach to classification: psychoanalytic writers, past and present, have been sharply critical of attachment theory as enunciated by Bowlby. Anna Freud (1960) took Bowlby to task from the very start for offering mere "descriptive" as opposed to "metapsychological thinking" (p. 57); to her, his accounts of the infant's external attachment behavior lacked any acknowledgement of the drives and their mental representations, the pleasure-pain series, or mental fantasy. Spitz (1960) similarly chided Bowlby for his "undynamic formulation" (p. 86), and failure to account for id, ego, and superego, among other intrapsychic forces. By excluding so much that is considered central to psychoanalytic conceptions of the infant's early dynamic functioning, Bowlby, to such critics, was left with a limited theory in which "physical separation is understood to be the source of almost all psychopathology" (Brody, 1981, p. 822).

Though, as the preceding pages have shown, attachment theory has changed considerably since Bowlby's original formulation, contemporary attachment theorists still bear the brunt of his particular biases, and admittedly face the challenge of making attachment theory more all-encompassing of infant behavior, and more compatible with established models of intrapsychic functioning. The present study is part of recent efforts, begun in earnest with the work of Main, to faithfully take up this task. It is one of the goals of this study to examine more closely the contents of internalized representations of attachment, believed to figure so importantly in infant character formation, both pathological and healthy. It is hoped that this study contributes to the necessary broadening of the attachment construct in other ways as well. Through the use of an experimental encounter with novelty, it is expected that this study will chart the workings of attachment in areas of functioning independent of separation. Through the agent of affect, it is hoped that group differences will be

brought into clearer focus in this study, and the classification system itself under closer scrutiny.

## II. The End of the First Year: Developmental Achievements

### A. The Wider World of the 10-Month-Old: Two Classical Theories

The simplest way to measure how great the gains have been in the field of modern infancy research is to take stock of the radical changes that have made their way into the timetable we now use for understanding the events of the first year of life. It is illuminating to realize that, as recently as 1960, when Margaret Mahler embarked on her classic study of the separation-individuation process, she did not even initially recruit infants much younger than the second year of life, because it was not until then that she thought the process had even begun (Mahler et al., 1975)! Subsequently, Mahler revised her thinking and located the onset of separation-individuation much earlier, around the fifth month of life. Yet, within just a few years of the publication of her work, critics had produced both theoretical and empirical challenges to her claim that the infant's psychological emergence lagged even that far behind his biological birth (Peterfreund, 1978; Stern, 1985).

Nonetheless, Mahler's work stands as an important psychoanalytic treatise on infancy, and a benchmark against which subsequent theories have been measured.

Mahler et al. (1975) state that the infant begins life in a state of undifferentiated union with the mother and only gradually undergoes separation-individuation, in a process that occurs from the fifth month through the second and third years, and consists of four different subphases. The 10-12 month-old infant is situated in the second subphase of this process, called "the practicing period" (p. 65), when the infant's efforts to attain greater independence are facilitated by his expanding locomotor skills. The practicing period itself consists of two distinct parts.

The "early practicing phase" covers the age of 7-10 months, when the infant first becomes able to physically distance himself from his mother by crawling, climbing, standing, etc., but is still "holding on" (p. 65). It is followed by the "practicing period proper," from 10-12 months to 16-18 months, when the infant is literally launched into the wider world around him through the advent of "free, upright locomotion" (p. 65). The 10-12 month stage, coming as it does in-between these two periods, occupies a special, transitional niche. The infant might not yet be walking, but is, at this age, exercising his new-found motoric skills in a still-bounded physical environment which is anchored by his mother. One might say that in the early practicing period, the circumference of the infant's world is extended subtly, whereas, in the practicing period proper, the dimensions of that world are redrawn completely. Mahler et al. describe this tender shifting of boundaries at the end of the first year, this way:

Expanding locomotor capacity during the early, practicing subphase widens the child's world; not only does he have a more active role in determining closeness and distance to mother, but the modalities that up to now were used to explore the relatively familiar environment suddenly expose him to a wider segment of reality; there is more to see, more to hear, more to touch. How this new world is experienced seems to be subtly related to the mother, who still is the center of the child's universe from which he only gradually moves out into ever-widening circles. (p. 66)

Writing from a cognitive and wholly different perspective, Werner and Kaplan (1984) also speak of the "widening circle" of an infant's world throughout the first year of life that, for them, helps explain the child's developing capacity for symbol formation. Like Mahler, Werner and Kaplan believe that the infant begins life in a state of undifferentiation, a "pre-symbolic situation in which there is little differentiation in the child's experience between himself, the Other (typically the mother), and the referential object" (p. 42). It is only with "progressive distancing" (p. 42) of self, object, and other that symbolic activity can arise, for in order to use a

symbol, a child has to communicate to somebody, about something, that is out there. Thus, Werner and Kaplan feel that an infant has to achieve a certain degree of physical autonomy in space, in order to even be able to engage in symbolic communication. It is for this reason that they see the emergence of the act of reference towards the end of the first year as a milestone in the road to symbolization. Pointing and shared reference signal, to Werner and Kaplan, that the infant has undergone the requisite developmental steps, enabling him to shift his mode of engagement with the world from "action on or with things," to "contemplation of things" (p. 67). This shift leads to symbolic activity.

Thus, common to both psychoanalytic and cognitive accounts of development is the belief that critical changes take place at the end of the first year that make the configuration of the infant's world triadic for the first time (Trevarthen & Hubley, 1978). The infant is able to take in a wider sampling of the world around him, as boundaries gradually expand, but does it through the familiar context of shared experience with his caretaker. The infant emerges from his state of fusion with his mother slowly, according to both Mahler and Werner and Kaplan; at 10-12 months, her influence is still all-important, as all new experience is filtered through her.

Though differing in their perspectives, these two classical accounts of infancy address a change in the capacities of the 10-12 month-old infant that the set-up of the present study draws on: the infant is asked to make meaning of an unfamiliar stimulus (robot), and to make use of his mother in doing so. The components of self, other, and object are independent, yet closely interwoven in the newly triadic cognitive and interpersonal framework that characterizes the 10-12 month stage of life.

## B. The Intimate World of the 10-Month-Old

### 1. The Advent of Mind

As significant as Mahler's theories are, she was primarily interested in the forces that fuel the progressive separation of mother and child, and paid less attention to the phenomena that make intimacy retrievable at each new stage of the infant's independence. In recent years, theorists interested in the development of language have seen the changes at the end of the first year in a new light. They believe that it is the infant's heightened abilities to express himself and communicate with his caregiver - across a newly-acquired physical distance - that serve as nonverbal precursors to the spoken language that emerges in the following year.

Trevarthen and Hubley (1978) point to the age of nine months as a critical juncture in the infant's consolidation of a host of communicative and interpersonal skills. Elaborating on the same triadic phenomena that attracted Werner and Kaplan, Trevarthen and Hubley say that it is at nine months that the infant demonstrates "full person-person-object fluency" (p. 215), wherein "a deliberately sought sharing of experiences about events and things is achieved for the first time" (p. 184). Trevarthen and Hubley have high regard for this achievement, for it is precisely at the moment that the infant is able to join his faculties for knowing about the world, with his interest in cooperatively sharing it with others that he comes into his uniquely human inheritance: "the un-selfcentered sharing of initiative on which human society and its cultural evolution depend" (p. 184). Trevarthen and Hubley detail the features of such behavior in a 10-month-old:

When a 10-month-old offers an object to the extended palm of another, makes a vocal and gestural utterance in the form of a command or declaration, responds with precise co-operation to a request expressed by facial signs and in gesture and speech, plays a give-and-take game, or obeys learned instructions of speech or gesture to choose objects

or perform specific manipulations with them, the expressive manner of what the infant does gives these acts a co-operative form seen in the behavior of no other species. (p. 214)

Trevarthen (1980) calls the ability of the 9 or 10-month-old to link objects and people in acts of shared meaning the achievement of "secondary intersubjectivity" (p. 335). (This is distinct from the earlier, simpler interpersonal skill called "primary intersubjectivity" [p. 325], that is evident at age 2-3 months.)

In their study of related preverbal phenomena, Bretherton and Bates (1979) focus on the emergence of "intentional communication". They define intentional communication as "signalling behavior in which the sender is aware a priori of the effect that a signal will have on his listener, persisting in that behavior until the effect is obtained or failure clearly indicated" (pp. 87-88). As Bretherton, McNew, and Beeghly-Smith (1981) point out, this definition implies that the infant also realizes that another person can understand his signal. Further, in order to have and send a message, and in order for another person to receive and understand it, the infant must have what Premack and Woodruff are quoted as calling "a theory of mind". An organism has a theory of mind, say Premack and Woodruff, if:

he imputes mental states to himself and others.... A system of inferences of this kind is properly viewed as a theory, first, because such states are not directly observable and second, because the system can be used to make predictions about the behavior of others. (Bretherton et al., 1981, p. 339)

But, argue Bretherton et al., "a theory of mind" does not, by itself, adequately account for the entire cognitive leap that the 9-month-old takes when he engages in intentional communication. Not only must the infant grasp that others have distinct, though unseen, intentions and plans as he himself does, he must also understand that he can have an active effect on his partner's intentions and plans. Thus, the 9-month-old more accurately possesses a "theory of interfacible minds" [emphasis added] (Bretherton & Bates, 1979; Bretherton et al., 1981).

## 2. The Sharing of Affect

### a. The Work of Daniel Stern

Daniel Stern (1985) integrates these currents of thought, and gives the achievements at the end of the first year new importance. Stern believes that, at each developmental juncture in the first three years, an infant acquires a different "sense of self" that permits a new experience of self, and a new way of relating to others to emerge. Each successive "sense of self" thus confirms the arrival of new capacities in the infant. From birth to two months, a "sense of an emergent self" reflects the infant's earliest efforts at organization; between two and six months, the infant's physical maturation and capacity for agency give rise to a "sense of a core self"; in the second year of life, language ushers in a "sense of a verbal self".

Between the age of seven and nine months, the infant's emerging awareness of his own and others' internal states convinces Stern that the infant has acquired a "sense of a subjective self". This development gives the infant a new "social feel" (p. 125) that the parents recognize and respond to by addressing his subjective experience for the first time, rather than his overt behavior. The bulk of parent-child interaction shifts to a new wavelength, wherein efforts to share innermost experience - "I know what you want," or, "Are you angry at me?" - take precedence. It is as if the infant becomes a more fully-fledged psychological, as well as social, partner at this age.

Like the theorists previously discussed, Stern believes that the preverbal infant is capable of communicating such internal experiences as intention and attention, but, for Stern, the sharing of affect is the special achievement of this age. Stern points to the phenomenon of social referencing, which gains prominence at this time, as evidence that one-year-olds have a new capacity to engage in affective

dialogue with their caretakers. In fact, other researchers have found that certain specific facial expressions of emotion only come into being in the latter half of the first year (Emde, 1980; Hiatt, Campos, & Emde, 1979). Thus, the 10-12 month-old infant exhibits both more articulated expressions of his own affective states, and a greater ability to take in the emotional signals of others. To Stern, whatever other communication skills emerge throughout the course of development, the exchange of affect, or "interaffectivity" (p. 132), remains the dominant language of mother-infant interaction, even when, later on, spoken words acquire a preferred, official status. Psychotherapists can certainly recognize the validity of this argument; in the so-called "talking cure," affect often supercedes language as the primary medium of communication and understanding.

So important is this exchange of affect that Stern believes that parents devise a new behavioral response to their infants at this age, uniquely designed to let their children know, nonverbally, that their feelings have been understood. Stern calls this new category of behavior "affect attunement" (p. 140). When a mother "attunes" to her child's affect, she reproduces the feeling state underlying the child's overt behavior, by expressing it in another modality. For example, when a 9-month-old boy strains to reach a toy just beyond his reach, and tenses his whole body with the acceleration of his effort, his mother might at the same time emit a string of effortful grunts - "uuuuuh... uuuuuh!" - that match the intensity and crescendo of his physical gropings (p. 140). An attunement is different from a straightforward "imitation" because its referent is the subjective experience underlying the infant's behavior, not the overt form of the behavior itself. In another respect, an attunement differs from a "comment" because, through attunement, a mother can enter into her child's affective experience, not merely remark on it in words. Thus, attunement provides the necessary final step in the process of "intentional communication" that the infant engages in at the end of the first year, and which Stern says is primarily affective in

nature: the infant performs some action that conveys an underlying feeling to his caretaker, and, through attunement, she signals him in return that she has "gotten it".

More than other infancy researchers, Stern recognizes the significance of intersubjectivity, especially its special relevance to clinicians: he states that, with its achievement, "psychic intimacy as well as physical intimacy is now possible" (p. 126). One can almost set the retrospective clock of psychoanalysis back to the end of the first year of life, when the self first becomes aware of being emotionally "read" by the other, to both good and ill effect. That is, the infant's affective awareness also brings vulnerability, to whatever is borne back by the response, be it sensitivity or skew. A host of questions attend the onset of intersubjectivity, which Stern summarizes this way:

Is subjective experience to be shared? How much of it is to be shared? What kinds of subjective experience are to be shared? What are the consequences of sharing and not sharing? Once the infant gets the first glimpse of the intersubjective domain and the parents realize this, they must begin to deal with these issues. What is ultimately at stake is nothing less than discovering what part of the private world of inner experience is shareable and what part falls outside the pale of commonly recognized human experiences. (p. 126)

Stern muses about the fate of subjective states that prove to be unshareable in the infant's experience with the other. Perhaps, in their defensive exclusion from the self, they form the basis for the "false self" or "not me" phenomena described by other clinicians (p. 210). Not that psychopathology need be so transparently "all-or-nothing" in its origins. No, the sources of pathology are made more subtle, and more insidious, by the realization that affect attunement plays a major role in parent-child interaction. Through "selective attunement" (p. 208), a caretaker can demonstrate to a child that only certain affective experiences bring acknowledgement and intimacy, whereas others produce inattention, or worse, ridicule. Thus do a parent's own

affective leanings and blind spots impinge on an infant's earliest efforts to attain emotional validation from the other. An anxious parent may so selectively identify with her infant's experience of fear that the child readily gets the message that expressions of alarm produce a special closeness with mother. Thus, such a process as selective attunement carries the seeds of character formation in the child.

This is also the point at which research into attachment, and affect in early infancy, converge. For the attachment construct is central in determining a caretaker's emotional expressiveness, and differential response to positive and negative affect. Thus, in order to understand the process by which an infant's affective identity is shaped, one has to examine the forces that bear on the parent's capacity to feel and communicate diverse emotional experience. This is precisely the question posed by the present study: what is the impact of the maternal representation of attachment on the infant's affective self?

b. Differing Views of Affect in the First Year

Before leaving this discussion of affect, it is important to note that there are differing views of infant affective capacities within the first year.

The recent work of Izard and Ekman has led to a resurgence of interest in the universality of facial expressions of discrete emotions (Emde, 1980; Fridlund, Ekman, & Oster, 1987). But researchers differ in their willingness to ascribe differentiated facial expressions of affect to infants younger than one - especially concerning such negative emotions as fear, anger, and sadness (Emde, 1980, personal communication, Dec. 21, 1988; Fridlund et al., 1987; Hiatt et al., 1979; Stenberg, Campos, & Emde, 1983; Stern, 1985). For example, in one study of 10-12 month-olds, Hiatt et al. (1979) concluded that "distress" may be a more

"parsimonious" (p. 1033) way of describing infants' negatively-toned responses to fearful cues, than specific discrete labels.

Emde (1980) has taken two approaches to the study of infant affect, one involving identification of "dimensions" of emotional expression, and the other involving "discrete categories" (p. 97). By "dimensions," Emde means such broad qualities of affective expression as "hedonic tone," that is pleasantness-unpleasantness, and "activation," that is, intensity. Emde has found that these dimensions are evident shortly after two months, and that hedonic tone is "predominant and pervasive" (p. 102) as an indicator of the young infant's affective state. In contrast, he believes that categorical forms of affect expression require more organization, develop more slowly, and may not become "fully developed" (p. 101) within the first two years. Thus, there is consensus that hedonic tone is clearly recognizable within the first year; according to Emde, it may be the earliest experience of affect (Emde, 1980; Stern, 1985).

Stern (1985) adds yet another way of imagining infant affective life. He emphasizes infants' qualitative experience of feeling, rather than their expression of categorical states. In fact, he invents a new term, "vitality affects," (p. 54) to describe those "qualities of feeling" that he believes are neglected by discrete labels, and that include such sensations as "'surging,' 'fading away,' 'fleeting,' 'explosive,' 'crescendo,' 'decrescendo,' 'bursting,' 'drawn out'..." (p. 54). Vitality affects occupy an important place in Stern's conception of interaffectivity; a mother's attunements are as much in response to her infant's vitality affects, as they are to his categorical states.

A quite different approach to the study of infant affect is offered by students of temperament. Rothbart (1986) defines temperament as "constitutionally based individual differences in reactivity and self-regulation" (p. 356), a conception that places certain categorical affects under its umbrella. Specifically, Rothbart (1981,

1986) identifies six "temperament dimensions" - and here she uses the term "dimensions" differently from Emde - in the Infant Behavior Questionnaire she developed for use with parents: activity level; smiling and laughter, or the affect of joy; fear; distress to limitations, or the affect of frustration; soothability; and vocal activity. Other investigators have utilized different categories in their conception of temperament. For example, Chess and Thomas (1984) organize temperament into the following nine categories: activity level; rhythmicity; approach or withdrawal in response to a new stimulus; adaptability; threshold of responsiveness; intensity of reaction; quality of mood; distractibility; attention span and persistence. For the purposes of the present study, more important than the variation in categories envisioned by these researchers is the degree of overlap, and the shared view of the infant as presenting certain "characteristics of basic importance to early social interaction that may have a constitutional base" (Rothbart, 1986, p. 357). That is, whereas Stern and attachment theorists promote the power of early mother-infant interaction to shape the developing child, adherents of temperament instead point to the importance of the child's own biological endowment in governing his subsequent growth and relatedness (Chess & Thomas, 1982a).

This, in a sense, is nature-versus-nurture, and proponents of temperament have indeed revived that historic argument with their criticism of the assumptions that drive attachment theory. The Strange Situation has again provided a forum for the debate. Critics such as Chess and Thomas (1982a, 1982b) and Kagan (1984) believe that aspects of a child's behavior in the Strange Situation may reflect temperamental qualities that have characterized him "from the opening days of life, long before he has had an opportunity to establish an attachment to another person" (Kagan, p. 59).

But Sroufe and Waters (1982) have challenged this suggestion. They maintain that "attachment and temperament are orthogonal" (p. 744), and that the

secure or insecure attachment classification can each be merited alike by infants whose temperaments differ considerably. They point out, for example, that during the Strange Situation secure infants vary greatly in the amount of crying they do in the mother's absence, and the wariness they display towards the stranger, both behavioral indicators of underlying temperamental differences. But the criterion behavior that all these infants share that earns them the like classification of secure attachment is their common readiness to greet their caregivers after separation and be soothed by their ministrations. Thus, Sroufe and Waters conclude, it is "the organization of the behavior with respect to context that reveals the quality of the attachment..." (p. 744), not individual differences in "behavioral traits" (p. 745).

The present study too is informed by an understanding of attachment and temperament as independent constructs. In keeping with Sroufe and Waters' guidelines, one may see the present study as placing the infant in the presence of a novel stimulus, and assessing his capacity to make use of his caregiver as an affective ally, as well as her capacity to serve as guide, rather than as a measure of his particular temperamental makeup. The pattern of mutual expectation and response, called forth in each dyad by this affective challenge, is the primary focus of this study, and the reason that attachment, and not merely temperament, is at issue here.

### III. Social Referencing

Social referencing describes a process whereby people "look to others when confronted with a variety of events and use the emotional reactions of others to regulate their own behavior" (Klennert et al., 1986, p. 427). It is a common social tool of both children and adults, but it has special significance in infancy. The emergence of social referencing at the end of the first year signifies that the one-year-old has

attained a certain level of maturity in his progress along two principal "developmental lines" (A. Freud, 1965). First, he has formed a specific attachment relationship with one or more figures, to whom he now looks for guidance as well as caretaking. Second, he has achieved intersubjectivity, the exchange of thought and feeling that precedes language.

In typical experiments on social referencing, infants are confronted with an ambiguous stimulus, for example a visual cliff, novel toy, or unfamiliar stranger. They are given access to emotional signals from their caretakers or from other adults close by, who are instructed to produce specific facial expressions such as fear, neutrality, or joy in response to these stimuli. In these situations, it has been found that infants do reference their caretakers or other available adults, and that their subsequent behavior is affected by adults' cues. For example, infants whose mothers assumed fearful expressions did not cross the deep side of a visual cliff, whereas infants whose mothers produced joy or interest did cross over; infants in the company of an experimenter who smiled at a novel toy approached the toy more readily than infants in the company of an experimenter who appeared frightened; infants whose mothers responded positively to a stranger directed more positive behavior towards the stranger themselves, than infants whose mothers responded neutrally (Feinman, 1982; Klinnert et al., 1986; Sorce, Emde, Campos, & Klinnert, 1985).

With data from experiments such as these, researchers initially viewed social referencing as an instrument of cognitive appraisal, called into play when the infant's own intrinsic appraisal processes proved inadequate to the task of evaluating an unfamiliar situation (Klinnert, Campos, Sorce, Emde, & Svejda, 1983). For this reason, it has commonly been believed that uncertainty drives the social referencing process. For example, Gunnar and Stone (1984) conducted a study in which infants were presented with three different stimuli, one aversive, one appealing, and one ambiguous toy. The investigators found that maternal affective responses to the

toys only had an effect on infant behavior towards the ambiguous toy, leading them to conclude that infants had arrived at independent appraisals of the attractive and frightening toys, and only used maternal input regarding the ambiguous toy.

Although this study supported the idea that social referencing operates under conditions of uncertainty, another study concluded otherwise. Klinnert et al. (1986) found that infants' behavior towards a robot was influenced by an experimenter's facial signals, even when the infants' reactions to it were not initially uncertain. Such results point to the possibility that social referencing is a broader communication phenomenon than was initially believed, with uncertainty serving as only one possible motivating factor in the infant's efforts to seek and take in information about an external event (Gunnar & Stone, 1984; Klinnert et al., 1986).

In the present study, social referencing behavior is not, in and of itself, a dependent measure. That is, this study does not seek to measure whether an infant looks at his mother, in response to a novel stimulus, or the frequency of such looking behavior. Rather, a social referencing paradigm is used here in order to examine infant affective capacities, and maternal responsiveness to her child. However, in linking these two variables, in arguing that a child's capacity to take in the world is undeniably shaped by his mother's ability to "know" it along with him, this study is examining the same phenomenon that is central to all social referencing experiments. That affective exchange is the principal conduit of knowledge passed from a mother to her preverbal child, is the premise shared by this and other social referencing studies.

Methodologically, this project departs from most research on social referencing through its use of a naturalistic setting. That is, in standard social referencing experiments, caretakers are instructed to "pose" specific facial expressions of joy, fear, neutrality, etc., often without gestures or sounds, in order to measure the impact of maternal signals on infant behavior. However, this is hardly

the form that a mother's emotional guidance to her infant is likely to take in the course of real life. Maternal affective cues are embedded in a gestalt of related behaviors, germane to this study, that include not only facial expression, but speech, sound, gesture, touch, and movement.

By freeing mothers to respond naturally here, we are not only replicating actual conditions of mother-infant interaction, we are also broadening the challenge of the social referencing paradigm to include mothers as well. That is, the robot is an anxiety-producing stimulus to mothers, as well as to infants, though of course for different reasons. It is an unfamiliar object, introduced midway through the protocol; it has a powerful effect on their children; and, given the very latitude to respond to it as they like, mothers' own caretaking abilities and beliefs are quickly called into play. How does a mother view her psychoeducational role vis a vis her child? Should she attempt to shape his affective response to the world? Whose version of reality is it important to advance? - his or hers?

Given license to respond naturally, mothers will enact their own answers to these questions. In doing so, they will draw on their innermost, at times unconscious assumptions governing their experience of intimacy, tolerance of anxiety, and capacity for competence. In other words, mothers will draw on the very set of ideas and beliefs that together comprise their respective representational models of attachment. The very value of this study is its demonstrating that not only conditions of togetherness and separation activate such internalized representations. Here, it is believed that a simple encounter with novelty - and there can be no more normative sample of daily mother-infant interaction - will tap the feelings and attitudes that comprise a mother's representation of attachment as meaningfully as a more graphic separation from her child would.

#### IV. Summary and Hypotheses

##### A. Summary

As the preceding pages have demonstrated, many theoretical currents have recently converged on affect, as the key to understanding infant development, especially within the first year.

Biologically, the human infant is prewired to get to know the world through his affective system. As Emde (1983) has argued, "our central nervous system is constructed in such a way that all experience is affective..." (p. 173). Already in the earliest months of life, hedonic tone plays a critical part in the infant's adaptation to the world, with the broad principle of pleasantness-unpleasantness guiding him to "avoid what is too little or too much..." (Emde, 1983, p. 173). By the end of the first year, the infant has also made progress in his development of discrete facial expressions of emotion, a system of expression universally shared by adults across cultures, but now known to first arise in infancy.

Moving from biology to development, we find investigators interested in the acquisition of language pointing to the end of the first year as a time when an effective communication system first takes shape between mother and child. Intersubjectivity, the shared understanding of feelings and other subjective experience, is the foundation of subsequent speech. It is also the developmental achievement that ensures the infant of continuing access to intimacy, even as he makes his way to greater physical autonomy from mother.

The development of speech aside, all observers of infants, professional and lay alike, have long known that affect is the special language of mother-infant interaction. At first it is the mother's turn to intuit her child's inner state: his cries, coos, smiles, and grunts are powerful affective signals that guide the mother to

correctly gauge his underlying wishes and needs (Emde, 1983). By the age of 7-9 months, the infant is equipped to reciprocate in the process: he can then, through the practice of social referencing, make use of her affective signals in return, to correctly interpret her feelings and the messages that she intends to convey (Emde, 1983). Thus does affect provide a bridge across otherwise impassable age and developmental barriers between caregiver and child.

Does it really ever change? Isn't it the special province of affect that it always provides a public pathway to private meaning - whether the differences traversed are born of age, culture, or, as in the process of psychotherapy, character structure? (Emde, 1983) Thus, to be emotionally "heard" by another brings self-validation and passage to intimacy; failure to have one's affective signals correctly acknowledged brings painful isolation and a rupture in relatedness. This is true in the interaction of mother and infant, as well as in the process that is so meaningfully parallel, that is, psychotherapy. The importance of this study is that it trains attention on the very era in development when the individual is poised at the threshold of this process, when one's affective self is first shared, and shaped, in infancy.

At the same time that affect has become primary in the understanding of early infant development, it has moved to the forefront of attachment research. It now appears that differing "states of mind" regarding attachment experience entail different "rules" that govern individuals' management of positive and negative affect (Main & Goldwyn, in press; Main et al., 1985). Secure attachment is now understood to be an ability to acknowledge, in self and other, a flexible array of emotional experience, whereas insecure attachment entails proscriptions in emotional life. Significantly, in both patterns of insecure attachment, detached and preoccupied, emotional functioning is thought to founder on the experience of

negative affect, creating individuals who are unable, in one case, to express their vulnerability, and in the other, to contain their anxiety.

Given the ascendancy of affect in recent theories about infancy, and its newly consequential role in attachment, it seems logical to undertake a study that joins these two lines of inquiry. This study aims to do exactly that: examine infants' emerging affective capacities, at the end of the first year, as they relate to patterns of attachment. This study takes one additional step: to seek this presumed relationship, between infants' emotional functioning and their caretakers' attachment organization. For, as Main and Goldwyn (in press) have recently shown us, it is the "state-to-behavior" link, between parental representation and infant response, that gives attachment patterns their force and longevity.

#### B. This Study and its Hypotheses

This project focuses on data that is drawn from a larger, longitudinal study of mothers and their first-born children. When the infants are 10-12 months old, they are videotaped in a series of play interactions with their mothers. Following an interlude of free play, a battery-operated toy robot is introduced into the playroom, and turned on by the experimenter. Its movement, sound, and flashing lights evoke uncertainty as well as some fear in the infants. Their affective responses to the robot, and their mothers' availability to them in this situation, are the subject matter of this study. These two variables will be examined alongside maternal attachment, in the expectation of finding predictable relationships between mothers' attachment organization and mother-infant response to this affective challenge.

The hypotheses of this study are as follows:

**Hypothesis 1:**

**Maternal attachment organization will predict to the flexibility of an infant's affective responses to the robot.**

- a) Infants of securely-attached mothers will express greater flexibility in their affective responses than infants of insecurely-attached mothers.**

**Infants of securely-attached mothers will be expected to produce a flexible series of affective responses to the robot. They will demonstrate the capacity to shift fluidly between one affective state and another, be it between positive and negative affect, or between one gradation of affect and another. In contrast, infants of insecurely-attached mothers will exhibit a lack of flexibility in their affective responses. They will remain confined primarily to one affective state, unchangingly, throughout their interaction with the robot.**

- b) Infants of preoccupied mothers will show a preponderance of negative affect in response to the robot, whereas infants of dismissing mothers will show a preponderance of positive affect in response to the robot. Infants of securely-attached mothers will show a preponderance of positive affect, but in the context of their flexible set of affective responses overall.**

**It is a premise of this study that central to the dynamics of insecure attachment is the problematic experience of negative affect. Here, infants of preoccupied mothers are expected to experience heightened stress, whereas infants of dismissing mothers will show few signs of upset in their otherwise positive response to a charged stimulus. Infants of securely-attached mothers will also**

express a predominance of positive affect, but set against a context of greater response variability. Thus, it is believed that the dynamics between mother and child that lead to an overall positive response in infants of both dismissing and secure mothers differ significantly. The child of the dismissing mother learns to minimize negative affect, whereas the child of the secure mother learns to negotiate it effectively.

**Hypothesis 2:**

Maternal attachment organization will predict to the quality of a mother's availability, in the face of her infant's encounter with the robot.

- a) Securely-attached mothers will demonstrate more flexible patterns of availability than insecurely-attached mothers.

It is believed that a match can be expected between the quality of a mother's availability and the quality of her child's emotional expression (Hann et al., 1988). Here, secure mothers will respond flexibly to their infants' positive and negative affect, and will modulate their responses to meet their infants' varying affective needs. In contrast, insecure mothers will display more invariant patterns of behavior, reflecting restrictions in their abilities to attend to their infants' feelings.

- b) Preoccupied mothers will demonstrate a high incidence of physical and verbal availability throughout their infants' interaction with the robot. Securely-attached mothers will demonstrate a high incidence of physical and verbal availability, but their individual responses will be more flexibly determined.

Dismissing mothers will demonstrate the lowest incidence of physical and verbal availability throughout their infants' interaction with the robot.

The robot's arousal of negative affect in their infants is expected to cause stress to preoccupied mothers, who will intensify their involvement with their infants. Securely-attached mothers will also demonstrate a high degree of physical and verbal availability, but in a context of greater response variability. Dismissing mothers will fail to acknowledge or will otherwise minimize the anxiety-producing features of the robot; of the three groups, then, they will extend the least availability to their infants.

Maternal attachment organization will be assessed using the Adult Attachment Interview (George et al., 1985). Infant affect will be measured using the Affect Rating Scale (Klennert, 1983). Maternal availability will be measured using the Emotional Availability Scale (Osofsky, Culp, Eberhart-Wright, & Hann, 1987). These measures will be described in the following section.

## CHAPTER TWO

### Method

#### I. Subjects

Subjects for this study came from "The Pregnancy Project," currently being conducted at the Department of Psychology of City College, the City University of New York, under the direction of Arietta Slade, Ph.D. The Pregnancy Project is an ongoing, longitudinal study of the relationship between maternal attachment and aspects of mother-infant interaction, in which subjects are followed from the phase of pregnancy to the second year of their infants' lives. Thus, the Project covers two distinct phases, pregnancy and infancy, in its examination of the ways in which early parenting behavior is shaped, and itself shapes, the young infant's life.

Prospective mothers are recruited to participate in the Project through fliers placed in various prebirth classes, exercises classes, and maternity shops in the New York metropolitan area. Participation in the Project is voluntary, and there is no remuneration except for transportation expenses. Women who contact the Project are screened over the telephone by the staff coordinator, and invited to participate if they are expecting their first child and are 34 weeks gestation or less; between the ages of 25-35; and married to or living with the father of the baby. Women who agree to participate are sent a letter explaining the Project, and the various procedures they will be asked to undergo. They are asked to sign consent forms, and informed that they can leave the Project at any time.

For the one and a half-two years that women optimally participate in the Project, efforts are made to guarantee confidentiality: researchers are changed at

each new stage of data-gathering, and all data, tests, and interviews are labeled and stored by code number, not name.

The decision was made to use a middle-to-upper-middle class sample, in order to eliminate the possible risk factors associated with other groups, such as mothers with a background of low SES. Eligibility was confined to women aged 25-35 in order to eliminate risks associated with pregnancy and birth in younger and older mothers. Thus, results from this study can not be generalized to other such populations, whose special properties warrant separate attention.

Clearly, the decision to study maternal attachment, and its impact on early parenting, means that fathers' roles in early infant development can not be examined here. Particularly within the past decade, as caretaking attitudes and practices have changed dramatically, awareness of fathers' unique contributions to infant development has grown considerably. Within the field of attachment research itself, it is well established that an infant develops attachment relationships with his mother and father independently, and may be simultaneously secure in one relationship and insecure in the other (Main & Weston, 1981). Though it is beyond the scope of this Project to study both sets of relationships, it is believed that the patterns of intergenerational transmission being traced here between mothers and their infants, will have applicability to future studies that focus on father-infant relationships.

Thirteen mothers had completed all preceding stages of the Project, and were available for study with their infants at the 10-12 month stage, from which the present study was fashioned. Among these thirteen dyads, nine infants were girls, four were boys. Because of sample size, findings from this study will be understood to be suggestive of group differences and trends, until replication of the study with larger samples can provide for broader-based conclusions.

## II. Setting

All interviewing, testing, and videotaping took place at either one of two infant-study centers, located at the C.U.N.Y. Graduate Center midtown campus, or at the City College uptown campus. The City College lab became the permanent facility for the Project approximately midway through the present study, at which point all data was collected there. The two labs offered comparable facilities. Both had a small, carpeted play room, with a comfortable chair for mothers to be interviewed in, and an infant seat/high chair in which to place babies. Age-appropriate toys, stuffed animals, dolls, etc. were provided for the various mother-infant play sessions. A single videotape camera was located behind a one-way mirror in the playroom of the Graduate Center lab. In the City College lab, two videotape cameras were available to record the subjects; both were positioned in the same location, behind a one-way mirror, but one camera was set up at knee-high level and was thus often preferred for coverage, since its lower field of view often captured infant subjects more effectively than the camera that was set up at tripod level.

## III. Procedures

Women who participate in the Pregnancy Project are seen for approximately three sessions during the pregnancy phase, and, after their babies are born, three sessions during the infancy phase. These sessions take place, respectively, when the women are 28-30 weeks, 30-32 weeks, and 32-34 weeks gestation; and then, after the births, when their infants are 4 months, 10-12 months, and 15 months old.

During the pregnancy phase of the Project, the emphasis is on the collection of extensive interview and psychological test material on the mothers. The only data collected during this phase that was used in the present study is the Adult

Attachment Interview (AAI), administered to all women at the final session of the pregnancy phase. The interviews were recorded on audiotape and transcribed in full. This measure will be described in the following section.

Throughout the infancy phase of the Project, women are interviewed about their experiences of motherhood and their feelings about their babies' development. Mother-infant play interactions are videotaped at 4 months and at 10-12 months, and the Strange Situation (Ainsworth et al., 1978) recorded at 15 months. The infancy phase of the Project concludes with a readministration of the AAI. The present study was shaped from data collected at the 10-12 month stage, so this protocol will now be described in full.

The 10-12 month protocol was designed with the aim of engaging dyads in a variety of playful and mildly stressful exchanges, in order to observe the mediation of affect between mother and child at the end of the first year of life. The specific procedures of the protocol were administered by one researcher (while a second operated the camera), in the following order:

- I. Mother seated opposite infant in high chair:
  - 2 minutes normal face-to-face play
  - 2 minutes mother's still-face
  - 2 minutes normal face-to-face play
- II. Mother and infant seated on floor, toys provided:
  - 8 minutes free play
  - < 3 minutes prohibition - robot introduced >
  - < 3 minutes prohibition removed - robot remains >
  - 3 minutes perturbation
  - 3 minutes normal free play

The still-face procedure, in which mothers became unresponsive in the course of face-to-face interaction, was expected to generate stress for infants. Free play was expected to provide infants with an interlude of interesting activity and pleasant interaction with their mothers. The perturbation was an experimental procedure in

which mothers were asked to alter their pacing, in order to observe the effects on infants.

The present study only used the data of the three-minute prohibition sequence and its three-minute follow-up when the prohibition had been lifted; these two segments are marked on the preceding list. In this portion of the protocol, a researcher brought the battery-operated toy robot into the playroom. The robot was approximately one-and-a-half feet high, black, and produced a loud, whirring sound and flashing lights when turned on. The researcher turned the robot on, and instructed mothers not to allow their infants to play with it for the first three minutes, though looking at it clearly was intended. Then, at the conclusion of three minutes, a researcher knocked on the one-way mirror to signal to the mothers that they could let their infants play with the robot if the infants wanted to. The two segments were initially separated in this manner to see if the parental prohibition itself had an effect on the infants, and to assess the extent to which infants initiated interest in the robot on their own. Outside of the instruction concerning the prohibition, mothers were told at the outset of the free-play interlude that preceded the robot segments, to try to interact with their infants as they naturally would at home.

During coding, the three-minute prohibition segment was judged to begin as soon as the robot stimulus had been turned on in the playroom, even if the experimenter herself had not yet left the playroom. Because all infants registered a response to the activation of the stimulus, even if the experimenter was still present, it was deemed important to begin coding with the onset of the stimulus. When there was more than three minutes of tape recorded for segment one (because the camera operator had allowed for the experimenter to enter/exit the room), data over and above the first three minutes was not analyzed.

Similarly, the beginning of the prohibition-lifted segment was judged to begin immediately after the experimenter had signaled the mother by knocking on the one-

way mirror. Three minutes were marked off and coded following the onset of this condition; occasional excess data was not analyzed.

Throughout data collection, it was consistently found that the mother's prohibition, per se, had little additional effect on her child's affective response to the robot. That is, a child who initially demonstrated interest in the robot, would continue to show interest despite the prohibition, and then, once the prohibition had been lifted, exhibit interest in other forms. Similarly, a child who was frightened by the robot would not overcome his aversion simply because his mother relaxed her prohibition. Thus, the infants' affective responses were geared to the robot, and clearly guided by their mothers, but were largely independent of the prohibition instruction itself. Thus, for two subjects, #11 and #13, who did not initially respond to the prearranged signal that the prohibition had been lifted (and had to be told so by an experimenter), segment two was still marked off as beginning with the signal, since the prohibition condition itself, on or off, had little additional effect on these subjects.

Three mothers who were taped in the early stages of this study turned the robot stimulus off during the second segment of the paradigm. Mothers #01 and #06 did this in an effort to alleviate the tremendous fear and upset of their infants. (Mother #06 even removed the robot from the room.) A third mother, #10, who turned the robot off also seemed to act out of a desire to modulate the stimulus, though her infant had responded enthusiastically to it - raising a question as to whether the desired effect was for her infant or herself. In all three cases, the mother-infant response pattern remained largely unchanged after the robot had been turned off: the distress of infants #01 and #06 persisted, and the combination of interest and neutrality of infant #10 remained intact. As a result, the decision was made to continue coding the data of these three dyads in their second segments.

Thereafter in the study, mothers were instructed not to turn the robot off throughout the six minutes of the paradigm.

Occasional instances of "missing" data were noted in appropriate intervals; such cases arose for different reasons in this study. For the dyad now identified as #13 (the first dyad to actually undergo taping in this study), experimenters did not realize that the videotape deck was not recording until the paradigm had already begun. For another dyad, now identified as #02, the mother's occasional use of a foreign language, in addition to English, made continuous coding of her speech (using a measure to be described later in this chapter) impossible.

However, the great majority of dyads produced six minutes of data from the two successive robot segments; along with the Adult Attachment Interview, this data furnished the remaining subject matter of this study. It is important to note that, although the number of dyads participating in this study may be limited, the six minutes of videotaped data that each dyad contributed - alternately divided into five and ten-second intervals on two different sets of measures - added up to a rich and considerable data base for this study. The measures to be used will be described in the following section.

#### IV. Measures

##### A. The Adult Attachment Interview (AAI)

The Adult Attachment Interview (George et al., 1985) is a structured, one-hour interview consisting of eighteen questions designed to elicit adults' feelings and thoughts about attachment-related experiences. The format of the interview can be likened to a questionnaire, in its precise phrasing and sequencing of questions, yet the administration of the AAI has more in common with a clinical interview, in its emphasis on allowing subjects time to think and elaborate answers. To facilitate a

relaxed and reflective atmosphere, interviewers memorize questions and probes. It was the hope of the authors that their conversational approach and focused questions would serve to "surprise the unconscious" (George et al., 1985, p. 6) of those being interviewed, and prompt them to reveal early memories and feelings about attachment.

The interview includes questions about the subject's early relationships with her parents, about separation and other childhood emotional experiences, as well as questions about the subject's current attitudes towards her parents and feelings about being a parent herself. Thus the authors of the interview sought not only to unearth a subject's attachment history, but to position her, as an adult, in relation to her own past, in a way that would reflect the degree to which she can integrate past and present life. The subject's capacity for integration is examined in yet another important way. Questions on the AAI are designed to elicit two different kinds of memories: general "descriptions of experiences ('semantic' memories) and specific biographical episodes ('episodic' memories)" (Main & Goldwyn, in press, p. 6). In subsequent analysis, these two narrative lines are compared for their overall consistency or incompatibility. The subject is then scored along a nine-point scale for the degree of coherency that she maintains, in balancing these two narrative versions of her past. A speaker who cites specific memories that support her generalizations scores high on coherency (9 is very "coherent"), whereas a speaker who offers contradictions and vacillations scores low ("incoherent") on this scale.

Transcripts of the interview are also scored along four other nine-point scales, measuring: the extent to which the subject's parents are judged to have been loving vs. unloving; the degree of idealization in the subject's attitudes towards her parents; the extent of the subject's memory for her childhood; and, the degree of anger that the subject expresses towards her parents.

Based on the profile that emerges from these five dimensions, a subject's "state of mind with respect to attachment" (Main & Goldwyn, in press, p. 22) is classified into one of three categories. An adult whose state is deemed "secure/autonomous" (p. 13) is found to value attachment relationships, view her parents thoughtfully and realistically, and present a coherent account of her life. It is the hallmark of the secure state that past experience is viewed objectively, whether the actual history being recalled is disturbed or trouble-free. An adult whose state of mind is "dismissing of attachment" (p. 13) devalues attachment relationships, often idealizes her parents despite conflicting memories, and thus offers contradictory accounts of her early life. It is also often the case that an adult whose state is "dismissing" says that she has little memory for childhood experience. Thirdly, an adult whose state is "preoccupied with attachment" (p. 13) seems to be entwined in her attachment relationships, yet often expresses marked anger towards her parents, and thus produces the most confused and disorganized accounts of her early life. In addition, it should be noted that a separate classification has also evolved for adults whose interviews markedly reflect the theme of "lack of resolution of mourning" (Main & Goldwyn, 1988, p. 57) in their lives, for attachment figures who were lost to them through death. Though such adults receive an initial designation of "U" - in keeping with their state of "unresolved" mourning - they are also assigned to one of the three classifications already described, that comprise the heart of the adult attachment system.

The AAI is administered twice to a subject during the course of the Pregnancy Project: first, during the pregnancy phase, when the subject is approximately 32-34 weeks gestation, and then, during the infancy phase, when the subject's child is 15 months old. Coding of the first AAI only was used for the present study. Interviews were coded by a team of Pregnancy Project researchers headed by Arietta Slade, Ph.D., who was herself trained by Mary Main.

Disagreements were resolved by Diane Benoit, M.D., an independent authority on the scoring of the AAI, who was naive to the hypotheses of this study. The present author remained blind to the mothers' attachment classifications until the data analysis stage.

#### B. The Affect Rating Scale (ARS)

The Affect Rating Scale (Klinnert, 1983) was developed by Mary Klinnert, the principal author of several of the original studies of social referencing. She created the ARS for use in a study that examined the referencing behavior of infants towards adults other than their mothers. In the so-called "Familiarized Adult Study" (Klinnert et al., 1986), 12-13 month-old infants were unexpectedly confronted with a mechanical toy robot that moved and emitted noises when it was activated. The ARS was used to assess infants' affective responses to this stimulus, before and after referencing. Thus, the ARS was designed for a comparably-aged group of infants, to judge their responses to a stimulus that is very similar to the one being used in the present study.

The ARS (Appendix A) is a nine-point bipolar scale that measures infants' affective responses from a point of high interest (+4) to a point of high fear (-4). Facial expression, gaze, and other behavioral indicators are factored into the scale points. Other dimensions of the scale include states of medium and low interest, in the category of positive affect, and states of nervous disruption and wariness in the category of negative affect. Thus, the ARS captures a range of conceivable affective responses, within a particular domain of infant affect. That is, as a stimulus, the robot was thought to be compelling and yet somewhat anxiety-producing; it was therefore likely to activate a particular spectrum of affective responses ranging from fear and agitation on the negative side, to interest and excitement on the positive

side. Measuring systems that entail a more global approach to the assessment of infant hedonic tone (covering, for example, such states as "fussing" in the negative end or "laughter" in the positive end) were judged to be too generic to capture the particular affective responses expected in this study (Emde & Easterbrooks, 1984). At the same time, because its scale points capture differences in level of activation, and variations in pleasantness-unpleasantness within a particular domain, the ARS is thought to measure properties of affective experience believed to be universal within the first year of life (Emde, 1980).

Various elaborations of the ARS dimensions, obtained in discussion with Mary Klinnert, are included in a Supplement (Appendix B). The Supplement also includes adaptations of the ARS, made with the permission of M. Klinnert, to reflect important differences between the present study and her earlier investigation. First, in this study, there was the added element of a maternal prohibition operating during the first three minutes, before infants were allowed full access to the robot if they desired it. Thus, additions were made to the original scale to incorporate the possible impact of a mother's prohibition on her infant, and the possible signs of an infant's interest in the robot if his mother was working to deter him from it (see the first items added to scale points +4 and +3, in the Supplement). Second, in the present study, mothers were not situated at a distance from their infants, as they were in the previous study; they were seated on the floor playing with them at the point of the robot's entry, and could thus be physically available. The possibility that infants would turn to their mothers, among other behavioral indicators of negative affect, was added to the scale (see the elaborations of scale points -3 and -4, in the Supplement).

The six minutes of videotaped data were divided into five-second intervals, and a best-fitting score given to each interval. As in the earlier study by Klinnert et al., the possibility of a combination score for a given interval existed, if an infant

performed behaviors from both ends of the scale that did not resolve into a single best-fitting score (M. Klinnert, personal communication, Feb. 9 and Feb. 24, 1989). In such an event, it was decided that a combination score would be given as it was in the earlier study (for example, +3/-3), and resolved during the process of data analysis by using averages for intervals scored in this way.

The decision to provide for the possibility that an infant might express more than one affective state simultaneously is supported by evidence in the literature for the existence of "blends" in infants of this age (R. Emde, personal communication, Dec. 21, 1988; Hiatt et al., 1979; Izard, 1983). Blends are defined by Izard (1983) as occurring when "appearance changes or components of two emotions [are] present simultaneously" (p. 31). In fact, in the study cited here by Hiatt et al., in which infant facial expressions of happiness, surprise, and fear were examined, the incidence of blends was found to be highest in the fear-eliciting condition.

Creating the possibility of combination scores also offered conceptual advantages. Theoretically, in the present study, the mother's availability might give the infant the capacity to experience more levels in his emotional response to the robot, than he might have experienced on his own. Observing the circumstances that could lead to combination scores, and what they meant, was thought to prove additionally interesting here.

For this study, an independent rater, Ilene Green, who was a doctoral student in psychology and blind to the hypotheses in question, was trained in the use of the ARS. For training purposes, a comparable data base was used belonging to Wendy Haft (1989), who videotaped mothers and their 9-13-month-old infants in interaction with the same robot stimulus. The present author developed a training manual (Appendix C) to govern application of the ARS as it was adapted for use with this paradigm. This manual was continually revised throughout training as discussions with the rater led to refinement of the scoring system.

A particular decision was made during this period to narrow the definition of the combination score (Appendix C, p. 118), so that such a "double" score would occur infrequently, and pose fewer potential problems in the data analysis stage. As resolved, a combination score - consisting of both a positive and negative number - was only given when an infant sought his mother's physical protection out of distress, and at the same time was seemingly strengthened by it, so that he could also produce a behavior of interest in the robot (like reaching, touching, pointing, etc.). Other rules were drafted to resolve remaining instances of multiple infant behaviors occurring in the same intervals (Appendix C, pp. 117-118).

Once the rater was trained to an appropriate level of reliability on the Haft data, the manual was finalized and coding of this study's data proceeded. (One prohibition segment of this study's data was used to establish reliability, since this same procedure had not been used by Haft.) The rater coded all tapes, and reliability was assessed using Cohen's kappa by comparing the rater's scores to the author's scores across six tapes: kappa ranged from .676 to 1.0, with a mean of .849. Major discrepancies were conferenced by the two raters to produce consensus scores. In calculating observed agreement, scores in adjacent as well as same categories were counted as agreement, because the ARS produces ordinal data, and Cohen's kappa was designed for only nominal data (Cohen, 1960). As Bakeman and Gottman (1986) advise, a figure of .7 was used as a guideline in assessing adequate reliability, even though lower kappas often attain significance.

### C. The Emotional Availability Scale (EAS)

The Emotional Availability Scale was developed by Osofsky et al. (1987) as part of a study that examined both mothers' and infants' "affective contributions" to the quality of the infants' attachment organization (Hann et al., 1988). Specifically,

the authors used the EAS to assess mothers' emotional availability during a modified version of the Strange Situation, with infants aged 13 months old. More broadly, though, the authors designed the EAS to be used in a variety of experimental situations, including the social referencing paradigm, with mothers in interaction with children aged 6-30 months. It should be noted that the concept of "emotional availability" has been discussed widely by Emde, who has advanced this term to describe a mother's accessibility and capacity for meeting the emotional needs of her infant (cited in Hann et al., 1988).

Osofsky et al. distill emotional availability into four separate components: a mother's physical, verbal, and visual responses to her child, and an additional component that covers the quality of the "affective exchange" that a particular mother-infant dyad achieve. The first three components on their own - physical, verbal, and visual behavior - are viewed as a measure of a mother's "availability" (D. Hann, personal communication, March 5, 1990). It is this measure, called "availability" and subsumed under the larger rubric of emotional availability, that is referred to throughout the present study. The very merits of this measure are that, through the use of distinct behavioral domains, it is possible to capture variations in the patterning of mothers' availability from one attachment group to another. Such distinctions would not be possible if a more global measure of maternal presence (for example, "sensitive" versus "insensitive") had been used here.

In the system devised by Osofsky et al. (Appendix D), a mother's physical, verbal, and visual behaviors are scored in separate five-point scales. Each rating scale is organized so that a score of 1 indicates little or no availability, a score of 2 indicates "functional availability" (p. 1), and a score of 5 indicates a high degree of "reciprocal responsiveness" (p.1). A score of 3 is generally given when a mixed level of availability is achieved, and a score of 4 when a mother indicates initiative in signaling her availability. So, for example, a mother would be scored 1 in all three

domains if she: failed to respond to her child's physical cue, failed to respond to her child's vocal cue, and avoided her infant's gaze. Conversely, a mother would be scored 5 in all domains if she: responded with warm physical contact to her child's physical cue, supplied a meaningful verbal response to her child's vocal cue, and returned her infant's visual gaze. In each domain, the infant is also scored as giving or not giving a cue, so that a sense of the mother's attentiveness to her child's signals can be built into the final score sheet.

The six minutes of videotaped data were divided into ten-second intervals and a score recorded in each domain, for each interval. The mother's "best" score in an interval was recorded. The authors of the EAS have used fifteen-second intervals to score mothers with 13-month-old infants, and shorter ten-second intervals to score the more complex behavior of mothers in interaction with 20-month-old infants. Because of the charged nature of the robot stimulus, the decision was made to use the shorter ten-second interval here, in order to capture the greatest possible range of maternal behaviors.

During data collection, it was evident that the visual domain would prove impossible to score in the present study. The authors of the EAS specify that, in order to score visual behavior, both the mother's open eye and the infant's open eye must be on camera in full face or profile. Given the simple, single camera technology of the present study, clear coverage of both mother and infant gaze was not consistently obtained. However, it should be noted that in the set-up of the current study, the mothers' proximity to their infants and the particular nature of the stimulus made it likely that mothers' physical and verbal responses to their infants would figure more prominently than their visual behavior. Since technical limitations prevented scoring of visual behavior, physical and verbal domains only were coded. Coding two out of three "legs" of availability is exactly how the original authors have

resolved technical limitations, and how they have themselves, to date, applied this scale (D. Hann, personal communication, Feb. 2, 1989).

Though initially considered of potential interest here (though outside the realm of the hypotheses in question), the remaining portion of the EAS that assesses "affect exchanges" was not incorporated into the present study. The reason for this was that the authors of the EAS took a more restrictive approach to the definition of affect, than the author of the ARS had in designing her scale. Many of the infants' responses in the present paradigm would not have been viewed as expressions of affect, per se, in the system used in the EAS. The present author made the decision to adopt the approach to affect that informed the ARS, and avoid glaring discrepancies between the two scales by setting aside this portion of the EAS.

The author of the present study was trained on the EAS at Louisiana State University Medical Center, in consultation with Della Hann, Ph.D., one of the authors of the measure, and with graduate students trained to proficiency on the scale. The author established reliability by applying the EAS to a robot paradigm that was recorded in a comparable data set obtained from Wendy Haft (1989). During this period, the author developed a training manual (Appendix E) to govern applications of the EAS as it was adapted for use with the robot paradigm, and with the middle-class subjects this study had drawn. Adaptations were made in consultation with Dr. Hann. The training manual was revised as discussions with Dr. Hann and Claire Peebles, a graduate student from the LSU lab who worked with the author as she obtained reliability, led to refinement of the scoring system as it was applied to this study.

Once the author was trained to an appropriate level of reliability on the Haft data, coding of this study's tapes proceeded. (Two prohibition segments of this study's data were used to establish reliability, since this same procedure had not

been used by Haft.) The author coded all tapes, and reliability was assessed across five tapes, using Cohen's kappa, by comparing the author's scores to scores of the same tapes by independent rater Claire Peebles, who was blind to the hypotheses in question. In the physical domain, kappa ranged from .763 to .896, with a mean of .838. In the verbal domain, kappa ranged from .566 to .908, with a mean of .747. A figure of .7 was used as a guideline in assessing adequate reliability, even though lower kappas often attain significance (Bakeman & Gottman, 1986). A separate figure was derived to represent percentage agreement on the incidence of child cues in the physical and verbal domains. In the physical domain, percentage agreement on child cues ranged from .444 to 1.0, with a mean of .747. In the verbal domain, percentage agreement on child cues ranged from .5 to 1.0, with a mean of .664.

## CHAPTER THREE

### Results

#### Introduction

Selection of statistical measures to test this study's hypotheses was carefully tailored to the particular properties of the data base at hand. That is, although a small sample of thirteen subjects generated the data of this study, these dyads produced an extensive supply of time-based intervals to examine. Specifically, the six minutes of tape, scored every five seconds for infant affect, on each of thirteen subjects, yielded a maximum distribution of 936 intervals; scored every ten seconds for maternal availability, the data produced a maximum distribution of 468 intervals. Thus "intervals" were frequently selected as the unit of analysis in this study, in order to permit parametric testing and to maximize power. Nonparametric tests and analysis by subject were also used, where indicated, to buttress and elaborate on parametric findings.

Although findings based on "intervals" allow for limited generalizing, they serve to strongly signal the likelihood of results were a larger n of subjects to be used. Thus, though caution must be used in interpreting some of the results presented here, this study's contribution is in framing and highlighting the hypotheses that would be profitable to pursue, were a larger pool of subjects available.

The attachment classifications of the mothers of this study, revealed via the AAI's, were as follows: five mothers were found to be "secure/autonomous", five mothers were "dismissing of attachment", and three mothers were "preoccupied with attachment". Whereas the expected distribution of these groups in the population is

60% secure, 30% dismissing, and 10% preoccupied, the present sample produced a distribution that was 40% secure, 40% dismissing, and 20% preoccupied. The present sample, then, was skewed in the direction of insecure attachment. Though both insecure attachment groups were represented here at levels disproportionate with their constituency in the population at large, their very presence made comparative analysis of the three groups in this study more substantive.

For the purpose of data analysis, the various attachment classifications were distributed across intervals as follows: on the measure of infant affect, 359 intervals were grouped under the classification of secure attachment, 215 were grouped under preoccupied, and 332 were grouped under dismissing. On the measures of maternal availability, in the physical domain, 180 intervals were grouped under the classification of secure, 108 were grouped under preoccupied, and 168 were grouped under dismissing; in the verbal domain, 180 intervals were grouped under secure, 108 were grouped under preoccupied, and 162 were grouped under dismissing.

Results will be presented by hypothesis.

I. Hypothesis 1: Infant Affect

Maternal attachment organization will predict to the flexibility of an infant's affective responses to the robot.

- 1a. Infants of securely-attached mothers will express greater flexibility in their affective responses than infants of insecurely-attached mothers.

Flexibility of infant affect was measured by calculating an average "change" score on affect for the infants of each maternal attachment group.

An individual "change" score was computed by using the raw scores obtained with the Affect Rating Scale, and by subtracting each interval's score from the next interval's score: that is, affect score at time interval 2 minus affect score at time

interval 1, T3-T2, T4-T3, etc. Absolute values of these change scores were recorded to eliminate negative numbers. Then, the overall means of these change scores were recorded by attachment group, as shown in Table 1. Note that in this case, a group's "mean" is not only an average, but because it summarizes "change" scores, it is a measure of variability as well.

Table 1

Mean "Change" Scores on Infant Affect, by Maternal Attachment Group

	Secure <sup>a</sup>	Preoccupied <sup>b</sup>	Dismissing <sup>c</sup>
Mean	.6466	.4413	.5182
Variance	1.1206	.8798	.7671

Note. Variances of the three groups were unequal.

<sup>a</sup>n = 358 cases

<sup>b</sup>n = 213 cases

<sup>c</sup>n = 330 cases

N = 901

As predicted, regarding infant affect, the mean change score of infants of secure mothers was greater than the mean change scores of infants of preoccupied and dismissing mothers. The results of a one-way analysis of variance (ANOVA) showed that this difference was significant ( $F=3.31$ ,  $df=2$ , 898,  $p<.05$ ).

Posthoc pairwise comparisons, using a Newman Keuls procedure, showed that the mean change score of infants of secure mothers was significantly greater than the mean change score of infants of preoccupied mothers. This difference was significant at the .05 level. The mean change score of infants of secure mothers was also greater than that of the infants of dismissing mothers - that is, in the predicted

direction. This difference, however, was not great enough to achieve actual significance.

Because the distributions of change scores had unequal variances, as supported by a Cochran test (Cochran's  $C=0.40$ ,  $p<.005$ ), a nonparametric test was run to substantiate the findings of the parametric ANOVA. A Kruskal-Wallis test produced mean ranks of change scores, on infant affect, according to attachment groups as follows: mean rank, secure - 472; mean rank, preoccupied - 406; mean rank, dismissing - 457. As with the ANOVA, then, mean ranking of change scores on affect was highest for infants of secure mothers and lowest for infants of preoccupied mothers. The differences among the three groups were found to be significant (corrected for ties,  $\chi^2=12.29$ ,  $df=2$ ,  $p<.005$ ).

Thus, the results of the nonparametric test supported the findings of the one-way ANOVA, by showing that infants of secure mothers had the highest average change scores, of the three groups.

As predicted then, infants of secure mothers produced the most flexible sequence of affective responses, to the robot stimulus. Group differences in flexibility were found to be greatest, that is, statistically significant, between infants of secure mothers and infants of preoccupied mothers.

- 1b. Infants of preoccupied mothers will show a preponderance of negative affect in response to the robot, whereas infants of dismissing mothers will show a preponderance of positive affect in response to the robot. Infants of securely-attached mothers will show a preponderance of positive affect, but in the context of their flexible set of affective responses overall.

The direction of infant affect was measured by calculating a mean affect score for the infants of each attachment group, from the raw scores obtained with the Affect Rating Scale.

Table 2

Mean Scores on Infant Affect, by Maternal Attachment Group

	Secure <sup>a</sup>	Preoccupied <sup>b</sup>	Dismissing <sup>c</sup>
Mean	+0.9596	-0.5163	+1.2018
Variance	4.6359	5.8023	6.3308

<sup>a</sup><sub>n</sub> = 359 intervals

<sup>b</sup><sub>n</sub> = 215 intervals

<sup>c</sup><sub>n</sub> = 332 intervals

N = 906

Inspection of the mean affect scores by maternal attachment group shows that they are in the predicted direction: infants of preoccupied mothers exhibited a preponderance of negative affect in response to the robot, while infants of secure and dismissing mothers exhibited a preponderance of positive affect.

A one-way ANOVA of the mean affect scores showed that the differences among the three groups were significant ( $F=38.48$ ,  $df= 2$ ,  $903$ ,  $p<.001$ ). Posthoc pairwise comparisons, using a Newman Keuls procedure, showed that the mean affect score of the infants of preoccupied mothers was significantly different from both the mean affect score of the infants of secure mothers, and the mean affect score of the infants of dismissing mothers. Both differences were significant at the .05 level. Finally, though the mean affect score of infants of dismissing mothers was slightly

higher than that of the infants of secure mothers, the difference between these two groups was not significant. This result also supported the hypothesis.

Consistent with hypothesis, then, infants of preoccupied mothers seemed primarily trapped in an experience of negative affect throughout this paradigm. Infants of secure and dismissing mothers, in contrast, shared a primarily positive response. Infants of preoccupied mothers, therefore, stood out for the singularity of their apparent distress, in response to the novel stimulus of this experiment.

## II. Hypothesis 2: Maternal Availability

Maternal attachment organization will predict to the quality of a mother's availability, in the face of her infant's encounter with the robot.

### 2a. Securely-attached mothers will demonstrate more flexible patterns of availability than insecurely-attached mothers.

As in the case of infant affect, flexibility of maternal behavior was measured by calculating an average "change" score in the physical and verbal domains respectively, for the mothers of each attachment group.

An individual "change" score, physical or verbal, was computed by using the raw scores obtained with the Emotional Availability Scale, and by subtracting each interval's score from the next interval's score in the relevant domain: that is, physical score at time interval 2 minus score at time interval 1, T3-T2, T4-T3, etc. The same procedure was followed for mothers' scores on the EAS in the verbal domain. Absolute values of these change scores were recorded to eliminate negative numbers. Then, the overall means of these change scores were recorded by attachment group, as shown in Tables 3 and 4. Note that, as was the case with this

measure on infant affect, a group's "mean" is not only an average, but because it summarizes "change" scores, it is a measure of variability in behavior as well.

Table 3

Mean "Change" Scores in Mothers' Physical Behavior, by Attachment Group

	Secure <sup>a</sup>	Preoccupied <sup>b</sup>	Dismissing <sup>c</sup>
Mean	1.2556	.8972	.8982
Variance	2.1688	2.0555	1.7185

<sup>a</sup><sub>n</sub> = 180 cases

<sup>b</sup><sub>n</sub> = 107 cases

<sup>c</sup><sub>n</sub> = 167 cases

N = 454

Inspection of Table 3 shows that mean change scores in mothers' physical behavior were in the predicted direction: secure mothers had a higher average change score, in their physical behavior, than either preoccupied or dismissing mothers. Interestingly, the mean change scores of preoccupied and dismissing mothers were almost equal, indicating that the rate of change in the physical behavior of the two insecure groups of mothers was roughly the same.

A one-way ANOVA showed that the differences among the three group means were significant ( $F=3.52$ ,  $df=2$ , 451,  $p<.05$ ). Posthoc pairwise comparisons showed that the mean change score of secure mothers, in the physical domain, was greater than the mean change scores of both preoccupied and dismissing mothers. Both differences were significant at the .05 level.

As predicted, then, secure mothers produced a more flexible sequence of physical responses to their infants, than both preoccupied and dismissing mothers.

Table 4

Mean "Change" Scores in Mothers' Verbal Behavior, by Attachment Group

	Secure <sup>a</sup>	Preoccupied <sup>b</sup>	Dismissing <sup>c</sup>
Mean	1.0833	1.3832	1.3789
Variance	1.0935	2.0498	2.7869

Note. Variances of the three groups were unequal.

<sup>a</sup>n = 180 cases

<sup>b</sup>n = 107 cases

<sup>c</sup>n = 161 cases

N = 448

Inspection of Table 4 shows that mean change scores, in mothers' verbal behavior, were not in the predicted direction: secure mothers had the lowest average change score, in their verbal behavior, of the three groups. The mean change scores of the preoccupied and dismissing mothers, in the verbal domain, were both higher than the secure but were roughly equivalent to one another. The differences among the group means were not large enough, however, to achieve significance, according to the results of a one-way ANOVA ( $F=2.47$ ,  $df=2$ ,  $445$ ,  $p>.05$ ).

Because the distributions of change scores in the verbal domain had unequal variances (Cochran's  $C=.47$ ,  $p<.001$ ), a nonparametric test was run to substantiate the findings of the parametric ANOVA. A Kruskal-Wallis test produced mean rankings of change scores, on mothers' verbal behavior, as follows: mean rank, secure - 218; mean rank, preoccupied - 234; mean rank, dismissing - 225. As with the ANOVA, though the mean rank of secure mothers' change scores was the lowest of the three groups, in the verbal domain, differences among the groups were not great enough to achieve significance (corrected for ties,  $\chi^2=1.12$ ,  $df=2$ ,  $p>.05$ ).

Thus, regarding hypothesis 2a, secure mothers exhibited important signs of flexibility in at least one domain of their behavior: they varied their physical behaviors in interaction with their infants, to a significantly greater degree than both groups of insecure mothers. Regarding verbal behavior, however, all three groups of mothers established fairly consistent levels of speech. Variability of verbal behavior, then, was not a distinguishing factor among secure and insecure mothers in this study.

- 2b. Preoccupied mothers will demonstrate a high incidence of physical and verbal availability throughout their infants' interaction with the robot.  
Securely-attached mothers will demonstrate a high incidence of physical and verbal availability, but their individual responses will be more flexibly determined.  
Dismissing mothers will demonstrate the lowest incidence of physical and verbal availability throughout their infants' interaction with the robot.

Two different approaches were taken to the measure of the extent of mothers' availability in this study. First, mothers' physical and verbal availability were each examined independently. Procedures for assessing availability in each domain, and the results of this measure, will be presented first in this section. Next, a composite portrait of each mother's physical and verbal availability will be drawn, integrating behavior from both domains. This analysis will be done by subject, and compared across attachment groups.

### (1) Availability Measured in Each Domain

It will first be recalled that scale points on the EAS are fashioned around the dynamic of infant cueing and maternal response. Greatest value is assigned to a mother's "reciprocal" response to an infant cue (5), and least value assigned to lack of a response (1). In addition, the EAS also permits scoring of maternal behavior independent of child cues. In this case, behavior can range from appearing merely "functional" (2), to indicating initiative on the mother's part (4).

For the purposes of this study, categories of maternal behavior were first identified, based on these original categories of the EAS. Such categories included, for example, instances of intervals that contained no infant cue and no maternal response, instances of intervals that contained an infant cue and a low maternal response of 1 or 2, instances of intervals with no infant cue and a "functional" maternal score of 2, etc. Because these categories were ordered, a new ordinal scale was created from them, to allow for the possibility of parametric tests. As seen below, the resulting six-point scale was considered a new variable, and was named the "Touching Scale" in the physical domain, and the "Talking Scale" in the verbal domain:

<u>EAS: Infant Cue and Mother's Score</u>	<u>"Touching Scale" and "Talking Scale" Score</u>
No cue; no maternal response/behavior	0
Cue; maternal response of 1 or 2	1
No cue; maternal score of 2	2
Cue; maternal response of 3 or 4	3
No cue; maternal score of 3 or 4	4
Cue; maternal response of 5	5

It should be noted that the authors of the EAS compute means on availability without factoring in intervals in which mothers produce no response. However, in this study, fully 1/3 of all intervals coded contained no physical response by mothers

(i.e. 144 intervals out of a total number of 456), and 1/5 of all intervals coded contained no verbal response (i.e. 92 intervals out of a total of 450). Given these high numbers, the present author considered it vital to include information on mothers when they produced no response, and thus incorporated this event into the touching and talking scales. Especially since this study created conditions of uncertainty and fear for mother-infant dyads to negotiate together, mothers' uninvolvement physically and/or verbally was seen as a revealing choice that could reflect critically on attachment classification.

Mothers' mean physical availability, as measured by the touching scale and organized by attachment group, is shown in Table 5.

Table 5

Mean Physical Availability of Mothers, as Measured by the Touching Scale

	Secure <sup>a</sup>	Preoccupied <sup>b</sup>	Dismissing <sup>c</sup>
Mean - touching scale	2.5111	1.8889	2.4940
Variance	3.9382	3.9689	3.2815

<sup>a</sup><sub>n</sub> = 180 intervals

<sup>b</sup><sub>n</sub> = 108 intervals

<sup>c</sup><sub>n</sub> = 168 intervals

N = 456

Inspection of Table 5 shows that group means on the touching scale were not in the predicted direction. Unexpectedly, preoccupied mothers had the lowest mean on the touching scale of the three groups. Also surprisingly, dismissing mothers and secure mothers had roughly equivalent means on the touching scale.

An overall one-way ANOVA found significant differences among the group means ( $F=4.20$ ,  $df=2$ , 453,  $p<.05$ ). Posthoc pairwise comparisons, using a Newman-Keuls procedure, showed that the mean of the preoccupied mothers on the touching scale was significantly lower than both the mean of the secure mothers and the mean of the dismissing mothers. Both differences were significant at the .05 level. There was no significant difference between secure and dismissing mothers.

On the measure of physical availability, then, results were unexpected: preoccupied mothers exhibited the lowest level of physical availability of the three attachment groups, and secure and dismissing mothers exhibited roughly equivalent levels of physical availability. The performance of both insecure groups was surprising here: prediction had provided for the greater physicality of preoccupied mothers, and the corresponding aloofness of dismissing mothers. Thus, the two insecure groups seemed to "trade places," as it were, in the results on the measure of physical availability.

Mean scores on mothers' verbal availability, using the talking scale, are presented in Table 6.

Inspection of Table 6 shows that group means on the talking scale differed in the predicted direction. Dismissing mothers had the lowest mean on the talking scale of the three groups. Preoccupied mothers had the next highest mean, and secure mothers had the highest mean on the talking scale.

An overall one-way ANOVA found significant differences among the group means ( $F=10.02$ ,  $df=2$ , 447,  $p<.001$ ). Posthoc pairwise comparisons, using a Newman-Keuls procedure, showed that the mean of the dismissing mothers on the talking scale was significantly lower than the mean of the secure mothers and the mean of the preoccupied mothers. Both differences were significant at the .05 level. The means of the secure and preoccupied mothers were not significantly different from each other.

Table 6

Mean Verbal Availability of Mothers, as Measured by the Talking Scale

	Secure <sup>a</sup>	Preoccupied <sup>b</sup>	Dismissing <sup>c</sup>
Mean - talking scale	3.6889	3.2870	2.8457
Variance	1.8692	3.3467	4.0941

Note. Variances of the three groups were unequal.

<sup>a</sup><sub>n</sub> = 180 intervals

<sup>b</sup><sub>n</sub> = 108 intervals

<sup>c</sup><sub>n</sub> = 162 intervals

N = 450

Because the distributions of means on the talking scale had unequal variances (Cochran's  $C=0.44$ ,  $p<.005$ ), a nonparametric test was performed to substantiate the findings of the parametric ANOVA. A Kruskal-Wallis test produced mean ranks on the talking scale, according to attachment groups as follows: mean rank, secure - 242; mean rank, preoccupied - 239; mean rank, dismissing - 199. As with the ANOVA, then, mean ranking of scores on the talking scale was highest for secure mothers, next highest for preoccupied mothers, and lowest for dismissing mothers. The differences among the three groups were found to be significant (corrected for ties,  $\chi^2=11.40$ ,  $df=2$ ,  $p<.005$ ).

Thus, dismissing mothers were found to exhibit a significantly lower level of verbal availability than both the secure and preoccupied mothers.

In summary, then, two important patterns were revealed in the results on the measures of availability, applied in the service of hypothesis 2b. Notably, and in keeping with prediction, secure mothers exhibited a consistently high level of

availability in both physical and verbal interaction with their infants. In contrast, the two insecure groups of mothers produced somewhat conflicting results. Preoccupied mothers defeated prediction, by exhibiting the lowest levels of physical availability; as a group their verbal availability was higher, however. Dismissing mothers exhibited the lowest levels of verbal availability, of the three groups, but actually resembled secure mothers in their physical behavior. The evenly robust performance of the secure mothers, and the corresponding lack of clarity in the insecure mothers, served as the backdrop for the next and final analysis.

## (2) Availability Patterns in Both Domains

In this concluding analysis, "availability patterns" of mothers were charted, using a technique described by Hann et al. (1988) to integrate information on mothers' physical and verbal performances.

In their study, Hann et al. first recorded each mother's modal scores in the physical and verbal domains. Only intervals in which mothers had produced a response figured into this calculation of modal scores. Modes were selected for this measure because they were thought to provide an "index of 'typical' maternal behavior" (Hann et al., 1988, p. 5). Once computed, modal scores of 1 and 2 were reclassified as "low availability" and modal scores of 3, 4, and 5 were reclassified as "high availability". These resulting classifications enabled Hann et al. to draw joint portraits of mothers' physical and verbal availability. This measure was replicated here, with the thirteen mothers of this study.

Using Hann et al.'s methodology, particular availability patterns were found to dominate each attachment group, as follows: secure mothers were primarily characterized by a pattern of high physical and high verbal availability (3 out of 5 mothers); preoccupied mothers were primarily characterized by a pattern of low

physical and high verbal availability (2 out of 3 mothers); dismissing mothers were primarily characterized by a pattern of low physical and high verbal availability (3 out of 5 mothers). These findings were noteworthy in a number of ways. First, as already seen in the results of a previous measure, secure mothers were characterized by a high level of availability in both domains. Yet, of even greater interest is the fact that the two insecure groups of mothers were indistinguishable from one another on this measure: both produced a pattern of low physical and high verbal availability.

This measure was repeated one more time, but for this trial, intervals in which mothers had produced no response were returned to the distribution, and used in the calculation of modal scores. This was done in the hopes that "absence" of response might lead to further distinction between the availability patterns of the two insecure groups. Also, intervals with no response were included on this trial because omitting them had resulted in only two availability patterns - high physical/high verbal and low physical/high verbal - emerging for the entire distribution of thirteen mothers. Finally, the phenomenon of "no response" was so frequent for some mothers that it appeared more "typical" of the behavior of these subjects than a scored response may have been. (0 was assigned when "no response" was a mother's modal score; these modes were placed in the "low" availability category.)

Interestingly, as Table 7 shows, adding intervals with no response to the calculation of modal scores had no effect on the secure mothers: they continued to be primarily characterized by a pattern of high physical and high verbal availability (3 out of 5 mothers). However, the pattern that characterized the two insecure groups in the preceding analysis did break down, when intervals with "no response" were included in the study. Strikingly, no one pattern emerged to dominate either insecure

group: the three preoccupied mothers exhibited three different patterns, and the five dismissing mothers exhibited a total of four different patterns.

In conclusion, the final analysis of mothers' combined availability patterns produced the following results: secure mothers were consistently characterized by a pattern of high physical and high verbal availability. The two insecure groups of mothers were alike, in that each group failed to produce a single, unifying pattern of availability. These results tend to suggest that "security" is a coherent phenomenon, that holds up to prediction across behavioral domains, as well as across a variety of measures. "Insecurity," in contrast, seems to resist generalization, both when efforts are made to capture it as an aggregate phenomenon, or as two readily distinct subgroups, preoccupied and dismissing.

Table 7

Availability Patterns of Physical and Verbal Behavior, by Subject and Attachment Group (Intervals with "No Response" Included)

Group	Subject	Modal Scores		Availability Pattern
		Physical	Verbal	
Secure	3	3	3	high physical/high verbal
	4	3	4	high physical/high verbal
	10	0	0	low physical/low verbal
	11	0	3	low physical/high verbal
	12	3	3	high physical/high verbal
Preoccupied	1	5	5	high physical/high verbal
	5	0	0	low physical/low verbal
	9	2	4	low physical/high verbal
Dismissing	2	2	0	low physical/low verbal
	6	3	5	high physical/high verbal
	7	2	3	low physical/high verbal
	8	0	3	low physical/high verbal
	13	3	0	high physical/low verbal

### III. Summary of Results

The results of this study's statistical analyses are presented in Table 8 in summary form. In tandem with this table, the following is a brief recapitulation of the findings, to inform the discussion that follows in the next chapter.

Both flexibility and direction of infant affect were measured in the course of the infants' exposure to the robot. As predicted, infants of securely-attached mothers produced the most flexible sequence of affective responses, to the charged stimulus of this paradigm. The tenor of the infants' responses also confirmed hypothesis: infants of preoccupied mothers were alone in displaying primarily negative affect, while infants of secure and dismissing mothers shared a primarily positive response. Findings on the measures of infant affect, then, highlighted the role of emotional flexibility in the organization of secure attachment, while pointing to the problematic nature of negative affect in, most clearly, preoccupied attachment.

On the measures of maternal behavior, group differences were sought in the flexibility of mothers' responses and the extent of their availability in physical and verbal domains. The performance of secure mothers proved to be consistent across a variety of measures: their physical responses were the most flexibly determined, and their availability was high in both physical and verbal domains. In contrast, the performance of insecure mothers was uneven across domains of their behavior. Preoccupied mothers exhibited lowest levels of physical availability, but higher levels of verbal availability; dismissing mothers exhibited lowest levels of verbal availability, but approximated secure mothers in their physical behavior. Efforts to pool physical and verbal data to fashion clearer portraits of the insecure groups also failed to produce uniform patterns in either the preoccupied or dismissing mothers.

From these results on the measures of availability, an apparent dichotomy seemed to take shape - between the known and consistent phenomenology of secure attachment, and the less consistent workings of the two insecure groups.

Table 8

Summary of Results

Table	Analysis	Significant Results
1	Flexibility of Infant Affect	Secure greater than Preoccupied Secure greater than Dismissing, but not enough to achieve significance
2	Direction of Infant Affect	Secure - positive Dismissing - positive Preoccupied - negative
3	Flexibility of Mothers' Physical Behavior	Secure greater than Preoccupied Secure greater than Dismissing
4	Flexibility of Mothers' Verbal Behavior	No significant group differences
5	Extent of Mothers' Physical Availability	Secure greater than Preoccupied Dismissing greater than Preoccupied
6	Extent of Mothers' Verbal Availability	Secure greater than Dismissing Preoccupied greater than Dismissing
7	Pattern of Mothers' Combined Availability	Secure - high physical & verbal Preoccupied - no single pattern Dismissing - no single pattern

## CHAPTER FOUR

### Discussion

#### I. Infant Affect

##### A. The Findings

This study was primarily designed to investigate an underlying premise concerning the workings of the attachment system: namely, that differing attachment organizations breed differing capacities for affective experience, transmitted from parent to child very early in development.

Towards that end, the hypotheses that lay at the heart of this study were strongly confirmed by the results. Infants of securely-attached mothers responded to a charged stimulus with the most flexible series of affective responses, and throughout the paradigm, managed to maintain a predominantly positive response. In contrast, infants of both insecure groups responded more unchangingly; they differed from one another in that infants of preoccupied mothers responded mostly with negative affect, and infants of dismissing mothers mostly with positive affect, to the challenge of this experiment.

The following case examples, presented qualitatively, will illustrate these results and serve to support the theoretical discussion that follows.

L. and her mother (dyad #3 in this study) offer a glimpse into the secure dyad's potential for emotional versatility. When the robot was first turned on, L. crawled right over to it, smiling and batting her arms in an ebullient state that her mother promptly echoed by exclaiming, "Wow! Oh boy!" Up close to it however, L.'s face suddenly sobered; she backstepped nervously away from the robot, and settled at a cautious remove. L.'s mother acknowledged the transition in L.'s feelings,

saying, "You don't know if you like that at all, do you?" L.'s mother then tried to interest her in a book, but, at the same time, she thoughtfully cleared various toys out of L.'s field of vision so that she could continue to watch the intriguing toy. For the remainder of segment one, L. was only partially able to enter into other games with her mother; defying distraction, she'd jerk her head nervously away from play, to stare at the troubling toy across the room.

When the prohibition was removed, L.'s mother lifted L. up into her arms, approached the robot, and reached to touch it with one of her own hands. At the moment she made contact with the toy, L. emitted a vicarious shriek, tinged with excitement and a sense of danger. In sensitive attunement to her child's precarious emotions, L.'s mother used the remaining minutes of this segment trying to effect a gentle greeting between her daughter and the toy. "Hel-lo, hel-lo, hel-lo," L.'s mother sang repeatedly, gingerly shaking the robot's hand with one of her own, all the while holding L. safely against her own body with her other arm. While other mothers tried to impose an adultomorphic view of this experience on their infants - "It's a robot," one mother said matter-of-factly, suggesting impatience with her mesmerized son - L.'s mother made her way through this paradigm patiently taking her child's perspective. In her own quiet overture to the toy, she respectfully acknowledged the lingering fear and tentativeness of L.'s inner state. Her willingness to serve as an emissary to this novel figure, on her daughter's behalf, was made touchingly apparent when, at one point, L. grabbed onto her mother's hand and tried to propel it across the space to the robot for her. Eventually, after another series of "hello's," L. was able to reach out and stroke the robot herself. By segment's end, L. was examining the toy closely, and laughing appreciatively as her mother imitated its whirring sounds.

Through the course of these six minutes, L. seemed to undertake the equivalent of an affective journey, suggesting inner states that included interest, fear,

alarm, shyness, humor, and delight. L.'s mother actively guided her daughter through this challenge, by attentively tracking each of her states and working to overcome her aversion by gently arousing her interest. She offered labels for each of L.'s inner experiences - "Wow! Oh boy!" "You don't know what to make of that, huh?" "That's a funny robot!" - thereby validating a world of emotional possibility for her.

It is also relevant to mention here that this study produced another index of the flexibility achieved by secure dyads, in the form of "combination" scores. It may be recalled that a combination score consisting of both positive and negative scale points on the ARS was awarded in an interval if an infant both sought his mother's physical protection out of distress, but was seemingly strengthened by it so that he could produce a positive behavior of interest or joy regarding the robot. Strikingly, only two infants in this study received combination scores, and they were both infants of securely-attached mothers. In both cases (infants #4 and #12), the infants reached for their mothers' bodies out of apparent fear; one (#12) needed to be held in her mother's lap for the remainder of the paradigm, the other (#4) held onto his mother with one hand at various points throughout the six minutes. But in both cases, the physical contact with the mother, though begotten in fear, resulted in the infants' strengthening ability to point at, reach for, and ultimately handle the robot. Though this could be seen simply as a case of secure mothers' offering physical support to their infants, a more subtle phenomenon also seemed to be at work in these intervals: namely, that secure mothers displayed a greater capacity themselves to "hold" competing feeling states together. Though levels of "affect maturity" (Thompson, 1986, p. 208) were not a specific focus of this study, there was a suggestion, in these instances, of secure mothers' modeling for their infants a complex tolerance for contradictory emotions - an intrapsychic goal that awaited their infants' later development.

A. and his mother (dyad #2), members of the "dismissing" group, met the challenge of this experiment in a manner wholly unlike L. and her mother. A. was drawn to the robot as soon as it was turned on. He maintained a fairly consistent level of interest in the robot throughout segment one; flirted briefly with apparent pleasure when he was allowed access to it at the start of segment two; then settled into a state of "medium interest" in the robot that he sustained unvaryingly across twenty intervals, before the experiment came to a close. Though A.'s response pattern was predominantly positive, it did not have the flavor of an achievement; that is, A.'s positive response felt almost ready-made, not as if it were the outcome of an effortful encounter with a range of alternative states. To the contrary, A.'s response, albeit positive, felt limited, and in its very fixity, lacking in dimension.

In striking contrast to the effort made by L.'s mother on behalf of her child, A.'s mother was notably absent throughout this paradigm. In segment one, she faithfully carried out the prohibition, saying "no" to her son several times as he tried to make his way over to the toy. Outside of this, and a brief question she asked of him, she remained silent. After bringing her son up close to the robot at the start of segment two, A.'s mother physically removed herself from the arena of interaction, dropping back several steps behind her son and the toy. From her pointedly offstage position, she made little physical contact with her son, and again commented infrequently. It was as if A.'s mother viewed the experiment as an occasion for A. to autonomously encounter this novel object, and divine its nature on his own; towards that end, she respectfully withdrew.

In one respect, A.'s mother's withdrawal illustrated the value that dismissing mothers often place in their children's independent exploration. The inanimate world is seen as a safe haven from potential needs and conflicts within the dyad; "curiosity" is therefore cultivated, by dismissing mother and infant alike, as A.'s behavior in this paradigm testified. But at the same time, A.'s mother's withdrawal

created a gap in A.'s external world that seemed to find corresponding expression in the very "thinness" of his affective life. The felt richness and intensity of emotional life, that are byproducts of being-with an "other", were seemingly unavailable to him.

Finally, the "preoccupied" grouping in this study included N. (dyad #1), whose traumatic response to the robot was among the most severe of all the infants in this study. As soon as the robot was turned on, a worried expression crossed N.'s face; his fingers tensed up as his hands froze in midair. His face darkened further over the next thirty seconds until his mother craned around to view his facial reaction herself. At his mother's approach, N. seemed to give way. He reached for her to pick him up, and from this point to the end of segment one, N. alternately clung to his mother's neck, cried, and sucked his thumb in terror. At various points in this segment, N.'s mother tried to loosen N.'s grip and put him back on the floor: he only pressed himself back onto her with greater insistence, at one point even clambering up and almost over her torso, in desperate search of an elusive safe place. To mollify N., his mother turned the robot off at the start of the second segment; though this had the effect of easing N.'s all-out panic, his agitation did not abate. He remained knotted up in anxiety until the remaining minute of this paradigm, when he was first able to begin to look at other toys. With the sole exception of six intervals, then, N. remained stuck in an experience of heightened anxiety, with only the intensity of his negative affect varying at times.

Though exquisitely responsive to N.'s feelings of anxiety, her own overreactions seemed to suggest that something in this paradigm was too much for N.'s mother as it was for N. For example, when the experimenter first brought the robot into the room (it was not yet turned on), N.'s mother seemed to set the ensuing tone through a dramatic exclamation, as well as a forecast of her son's response: "Oh my God! I can't let him play with that? Oh, maybe he'll be scared of it." Once the experiment was underway, she was unfailingly consoling to N. as he

progressively succumbed to fear. There were several moments in this paradigm when N.'s mother held him close, and either kissed or patted him, while reassuring him with statements like, "It's okay, Mommy's got you, Mommy's got you." At one moment in the second segment, N.'s mother knowingly gauged that N. could be soothed by hugging a stuffed animal; then, just as uncannily, she intuited when this "need" in her son had lifted.

All in all, then, it seemed that mutual anxiety moved N. and his mother to a particular level of intimacy, wherein they shared an understanding so special that it almost had the fervor of a pact. That is, N.'s mother seemed so identified with his feelings of distress, it was as if she allied herself with the perspective he presented of being overwhelmed, even "victimized" by this event. (For example, outside of turning off the robot, N.'s mother did not try to stop the paradigm altogether. Though her role as a subject in an experiment clearly entered into this, so too may have her natural readiness to play her son's protector.)

One further illustration of the anxiety experienced by N.'s mother needs to be mentioned here, because it reveals, as well, the depth and interrelatedness of the attachment material that this paradigm at times called forth. After N.'s panic subsided when his mother turned the robot off, she seemed to want to explain the inanimate status of the toy in a way that would put his crisis to rest. She brought the toy up close to him, in her own lap, and exclaimed dramatically: "It's dead, see? See, it's dead. It's dead. You can touch it, it's not gonna move. You want me to move it away so you can't see it?" As N. began to whimper again at this point, his mother removed the robot, and placed it lying down on its back a few feet away. She then concluded this somber ceremony by declaring, again, emphatically, "It's dead". She waved at the robot and said goodbye.

At the time, N.'s mother seemed to be introducing a shocking overlay of charged material to her already traumatized son: where was this display coming

from? This question assumed eerie significance when, in the course of data analysis, it was learned that N.'s mother was the only mother in this study who had earned a primary attachment classification of "U" - signifying her own state of unresolved mourning in her life - before being reclassified as "preoccupied" (see p. 55). Both classifications came to life in this interlude: both the conflicts over loss that had earned N.'s mother the "U", and the pull of self-absorption that had given her the air of being "preoccupied".

### B. Implications for Theory

The results of this study confirm a developmental dictum enunciated by Emde and Easterbrooks (in press). In their opinion, range of emotional expression is itself a "barometer" (p. 4) of the health of the parent-child system. "If the relationship is going well, there should be some indication of sustained pleasure and mutual interest, as well as a well-modulated range of emotional expressions, both negative and positive" (p. 4). If the relationship is not going well, "the range of emotional expression is restricted..." (p. 4). One has the sense of a relationship "going well" between L. and her mother, one feature of which is that all experience, whatever its valence, gains entry. That the relationships do not "go as well" between A. and N. and their caregivers is suggested by the missing or overvalued elements in their respective interactions, which also find expression emotionally.

The particular thesis that gave shape to this study was taken from Roger Kobak, who has suggested that the experience above all of negative affect lies at the heart of the attachment system. In his theory, too, range of emotional expression is key, but feelings of anxiety, frustration, anger, etc. achieve a central importance. Where the mother-infant relationship is "going securely," to use the previous terms, the infant is confident that he can bring distress to his mother and obtain relief.

Where the relationship is "going insecurely," the infant's upset meets with rebuff or inadequacy, outcomes that produce a tendency towards anger in "dismissing" individuals, and a tendency towards anxiety in "preoccupied" individuals. Kobak and Sceery (in press) have empirically tested these ideas with a population of adolescents, assessing attachment classifications through the AAI, and emotional functioning through questionnaires and self-report measures. The present experiment, which relied on the actual mobilization of negative affect between mother and infant, therefore seemed a useful extension of their work.

In brief, the results of the present study lend support to the broad strokes of Kobak's formulations, but not to all of his particulars. That is, in this study, infants of securely-attached mothers certainly exhibited an open and direct expression of all affect, including negative; the combination score itself, only awarded to secure dyads, literally confirmed that these infants "went to" their mothers expecting and receiving relief. The preoccupied group, limited in number though it was, also fulfilled prediction in this study: these were the only infants who exhibited predominantly negative affect throughout the experiment. In the two out of three infants who produced this group result, anxiety was indeed paramount. This was exemplified by N.

With the dismissing group, though, Kobak's ideas received only partial support. These infants' expression of predominantly positive affect could be seen as reflecting, as it seemed to with A., a history of having to turn away from mother with its consequent loss of affective life. However, was there reason to believe that hidden in A.'s somewhat stifled or workmanlike handling of this paradigm, feelings of resentment stirred towards his mother? No, nor did these feelings seem to play a dominant role in the responses of most other infants of dismissing mothers in this study.

Of course, the conditions of this experiment called into play the potential for infant anxiety more than anger. (As noted in an earlier chapter, the parental prohibition, which might have been expected to cause anger itself, was observed to have little effect and aroused only moderate irritation in one infant alone.) Thus, the full affective dynamics of the "dismissing" mode - which, according to Kobak, feature frustration over unmet needs, culminating in anger - may not have received an adequate trial in this study.

The conditions of the experiment aside, it was also true that the two insecure groups of infants in this study produced more variation in their affective responses than Kobak's hypothesized prototypes suggest. Though such variation in this study may have been a function of sample size, and though the variation was not great enough to defeat predictions on this measure - still, individual differences in infant affect were marked enough to warrant further understanding. For example, in the preoccupied group of three dyads, there was another infant (#5) in addition to N. who displayed an invariant series of negative responses. However, her distress was wholly unlike N.'s: she repeatedly rocked her body up and down, in a nervous ritual that had an autistic quality. As disturbing as her response was, it did not lead to the exaggerated display and dyadic enmeshment that were seen in N. and his mother, and were hypothesized by Kobak as characteristic of preoccupied attachment. The third infant in the preoccupied group exhibited a moderately positive response.

There was individual difference in the dismissing group too. Though the lifelessness of A.'s response seemed to reflect a history of emotional solitude, other infants in this group produced predominantly positive responses that were more robust, and less suggestive of dyadic distance. There was also one infant in the dismissing group (#6) whose spiraling distress in response to the robot prompted her mother to remove the toy altogether from the room. This infant's response

conveyed none of the "invulnerability" (p. 24) that Kobak and Shaver (1987) suggest may often prop up the dismissing persona.

What, then, can one conclude from this experimental effort to study the link between attachment and affect? With due regard for the limited size of the sample, it can be said that the results of this study confirmed a correspondence between maternal representation of attachment and infant affective behavior. Flexible emotional life is a distinguishing component of secure attachment, transmitted from mother to child; similar latitude was not observed in the affective responses of infants of insecure mothers here. Regarding the dynamics of insecure attachment, negative affect largely played the dominant role that was predicted in this study. Its centrality was clearest in the responses of infants of preoccupied mothers, for whom anxiety not only proved critical, but unmanageable as well. Also as predicted, negative affect was missing from the responses of most infants of dismissing mothers, its absence suggestive, at times, of an overall affective muting.

In qualitative terms, though the behavior of some infants in this study conformed closely to prediction - L., A., and N., for example - infants of insecure mothers exhibited differences in their emotional behavior that, while failing to affect prediction, were meaningful enough to also merit attention. Where interaction in these dyads was dysfunctional, negative affect was again central. But predicting the exact "look" of emotional incapacity in each of these dyads proved harder - and may be an elusive goal overall. For example, in a recent study of 2-4-year-olds and their mothers in a series of problem-solving tasks, Crowell and Feldman (1988) found that anxiety emerged in the responses of the children of dismissing mothers, and anger emerged in the children of preoccupied mothers. In reality, then, anxiety and anger may not be the exclusive preserve of either insecure style of attachment; the mismanagement of affect in these dyads may take different forms, depending on the demands that are made of them and the context in which interaction arises. This

idea matches a conclusion reached by Sroufe (1983), who has himself found it difficult to predict the specific patterns of maladaptation that the two insecure infant classifications - "avoidant" and "resistant" - respectively give rise to in these children's later development.

Thus, the pain and hostility that are bred by insecure ties can themselves be foreseen with certainty. But to know the exact way that life in a given dyad will stunt ensuing emotional development, one needs more than the knowledge of attachment classification: one needs to know the unique facts of an individual life.

Finally, in concluding this section, it may be recalled that one of the purposes of this study was to arrive at an understanding of the attachment construct that would lend itself to enhanced clinical appreciation. To date, the attachment construct has frequently undergone remodeling, and throughout its history, has alternately appeared in the form of internal working models, separation and secure base phenomena, unconscious rules, strategies for maintaining felt security, etc. (Ainsworth et al., 1978; Bowlby, 1969, 1980; Kobak & Shaver, 1987; Main et al., 1985). But a formulation lately offered by Sroufe offers clearest clinical value and elegantly captures the results of this study. Attachment, Sroufe suggests, is "dyadic regulation of affect" (personal communication, February, 1989). Sroufe (1982) believes that the attachment system is itself an outgrowth of an earlier developmental challenge faced by the infant with the help of his caregiver: "learning to maintain organized and coordinated behavior in the face of high levels of arousal" (p. 586). During the ages of 3-6 months, when this task is primary, the infant of a secure, responsive mother learns to manage high levels of stimulation, and remain intact, through the watchful guidance and regulatory efforts of his caregiver. In contrast, because of their unavailability, insecure mothers never help their infants negotiate tension at this earlier stage. As a consequence, such infants develop a "precocious overcontrol" (p. 590) of arousal, or a lowered tolerance for it altogether.

Though emotional development proceeds during the first year and more complex affect supersedes states of physiological arousal, the same principle of "dyadic regulation" applies. As viewed in L., the infant of the secure mother can withstand the excitement of a novel stimulus, and though at times is buffeted by the encounter, maintains equilibrium throughout. A., on the other hand, suggests the "overcontrol" and inability to give himself over to emotional experience, that derive from one kind of insecure relationship. Finally, N. dramatically illustrates the rapid descent into disorganization of an infant for whom arousal was never effectively modulated. For him, like A., affect can be toxic, but lacking A.'s protective guard, N.'s response to novelty is chaos.

In Sroufe's model, the process of "dyadic regulation of affect" originates in the attachment relationship, but ultimately resides in the child himself. Character is accordingly shaped, with children either "having" the internal controls to maintain organization in the face of affective challenge, or lacking them. The outcomes, either way, offer clinicians greater insight into the workings of health and pathology.

## II. Maternal Availability

### A. The Findings

The findings on maternal availability in this study could be seen to suggest an apparent dichotomy. Security was found to be a coherent and stable phenomenon, that held up to prediction across a variety of measures, as well as across a range of behavior. Specifically, in this study, secure mothers consistently offered their infants high levels of physical and verbal availability. The flexibility of their physical responses, in particular, demonstrated these mothers' further ability to adjust their support to their infants' changing needs.

Insecurity, on the other hand, was portrayed in this study as a variable state - both resisting generalization as an overall phenomenon, or as two readily distinct subgroups, dismissing and preoccupied. On particular measures of availability, the two insecure groups produced unexpected results. For example, perhaps this study's most surprising result was that, of the three groups, preoccupied mothers exhibited the lowest levels of physical availability - in spite of the tendency such mothers often reveal towards over-involvement in their infants' care. At the same time, preoccupied mothers exhibited higher levels of verbal availability. On the measure of physical availability, it was just as unexpected that dismissing mothers - often thought to be physically "cool" - achieved the same level as the secure mothers did. Their level of verbal availability, however, was the lowest overall.

The difficulty of capturing insecure maternal behavior in a way that would establish consistent group trends was best reflected in the results that were obtained when combined "availability patterns" were compiled from both domains (Table 7). On this measure, dismissing and preoccupied mothers separately failed to produce a single overriding pattern of behavior at all. In a sense these results represented a departure from other studies, in which dismissing and preoccupied mothers have recently been found to be distinct, through the former group's appearance of greater responsivity and the latter group's claim to greater incapacity (Crowell & Feldman, 1988; Haft, 1989). In contrast, the results of the present study - albeit possibly a function of the limited size of the sample - argued for the lack of consistent group distinction, between the two insecure groups of mothers.

The patterns of availability that were expected in this study have already been presented, in the vignettes of L., A., and N. and their mothers. L.'s mother's verbal attunement to her child and supportive use of her own body typified the high availability predicted for secure mothers. The withdrawal of A.'s mother illustrated the low levels of physical and verbal involvement that were hypothesized for

dismissing mothers. Finally, the very intensity of N.'s mother's response, expressed in intimate contact and verbal ministrations, reflected the high availability patterns - of a different nature from secure mothers' - that were also believed likely to characterize preoccupied mothers here.

Since, in the end, prediction did not uniformly hold up with the insecure groups in this study, what else did "preoccupied" and "dismissing" mothering look like in this paradigm? The following two examples, presented qualitatively, will serve to support the theoretical discussion that follows.

Both her deep reserve and glancing expressions of inappropriate affect suggested that O.'s mother (dyad #5) might be a member of the dismissing group, though she instead turned out to be preoccupied. O.'s anxiety, cited in an earlier discussion, was unsettling to observers because it appeared in almost symptomatic form, and because her mother remained eerily cut off from O.'s experience. O. stared wide-eyed at the robot as soon as it was turned on, shortly turning to her mother in what seemed to be an act of referencing for affective guidance. Her mother acknowledged O.'s question - "What's that?", she asked for O., about the robot - but she offered little more. O. looked worried when she turned back to the robot, but at this point her mother actually laughed. This glaring misattunement, like the periodic smiles O.'s mother exhibited, confirmed her distance from her daughter in this situation; only the dissociated quality of her expressions of pleasure kept them from seeming actively cruel.

At the end of the first minute, O. began rocking up and down. This tic-like response, suggestive of self-soothing, was repeated by O. throughout the paradigm, and signaled the degree to which she had seemingly given up on the prospect of help and had already learned to turn inward during stress. In fact, throughout this experiment, O.'s mother touched her daughter in only four out of seventy-two intervals, and spoke to her sparingly as well - a distance that was painful to observe

in light of O.'s agitation, and again, suggested "dismissing" attachment. In fact, throughout the six minutes, O. tensely clutched the receiver of a toy phone, in a final poignant symbol of her seeming aloneness.

In contrast, S. (dyad #13) lethargically "molded" her mother's body throughout the experiment. Though fatigue clearly contributed to this, at least on S.'s part, the passive physical welding of this dyad called up images of enmeshment, and suggested the possibility that S.'s mother might be a member of the preoccupied group - though she instead turned out to be dismissing. The sense of fusion between S. and her mother was often reflected in their identical positions. S. was seated in her mother's lap most of the time, her mother cross-legged on the floor herself. With both of them staring quietly off at the robot, one wondered whether there were two responses here, or more nearly one?

While S. exhibited little drive for autonomy, her mother's lack of independent initiative was striking as well. She made no effort to actively introduce the stimulus to her daughter, and when she spoke to S. it was often to make passive remarks like, "It's going away", or "It's coming over here". S.'s faithful, if fairly inert, gazing at the robot earned her scores of mostly positive "interest". But at one point when her mother tried to remove her from her lap and place her on the floor, S. turned apprehensively and grabbed her mother's shirt, in a bid to be picked up again and held. S.'s "clinginess" and display of underlying anxiety in this segment brought forth sympathetic responses from her mother, suggesting again the possibility of preoccupied attachment.

## B. Implications for Theory

The finding in this study that secure mothers were consistently attentive to their infants' needs confirms an existing body of evidence which documents a

correspondence between these mothers' secure organization of their own attachment histories and sensitive support of their children. Though the measures have varied, from study to study, and have at various times gauged mothers' help and support, capacity for attunement, or level of availability, as was the case in the present study, the range of these measures only adds further weight to the finding of robustness in secure mothering (Crowell & Feldman, 1988; Haft, 1989; Main et al., 1985).

Insecure mothers, as already noted, failed to exhibit consistent availability patterns. Furthermore, the link between representation and behavior was not, at first glance, as clearly drawn with these mothers as it had been with the secure mothers here. Possible discrepancies between representation and behavior, among the insecure mothers of this study, prompted various important questions, which will be the remaining focus of this discussion.

The findings on maternal availability patterns here conflicted with the results of a previous study by Hann et al. (1988), who applied the physical and verbal scales of the EAS to a group of adolescent mothers and their babies, and correlated the results to infant attachment classification. Although the predictor in their study was infant rather than maternal attachment, similar results to theirs were expected in this study because of a widely-held belief in the high correlation between infant and adult attachment classification (Main & Goldwyn, in press).

Hann et al. found that the mothers of the two insecure groups of infants in their study were characterized by cohesive availability patterns, that clearly differed between the two groups. Mothers of infants who were rated "resistant" - thought to correspond to preoccupied attachment in adults - exhibited a pattern of high physical and high verbal availability. This pattern was thought to reflect the tendency towards intrusiveness often seen in mothers of these infants (D. Hann, personal communication, February, 1989). Mothers of infants who were rated "avoidant" - thought to correspond to dismissing attachment in adults - exhibited a pattern of low

physical and high verbal availability. The low physical rating of these mothers was thought to confirm Ainsworth's own finding, in her original home observations, of aversion to physical contact in mothers of avoidant babies (cited in Hann et al., 1988). Mothers of secure babies were the only group who failed to produce a single pattern; this led the authors to speculate that these mothers probably varied their availability in keeping with their infants' needs.

Though their ideas and results made intuitive sense, the application of the EAS to the mothers of this study of course produced different results, even on the trial conducted with the measure calculated the same way Hann et al. had used it (see p. 77). Secure mothers had a consistent pattern here, high in both domains. Dismissing mothers exhibited the same pattern here as the mothers of avoidant babies had in the previous study - low physical/high verbal - but since preoccupied mothers also had this pattern in the present study, how accurately could this be said to be capturing a distinct "group" characteristic? Thus, a measure that was chosen for its very promise of distinguishing between the two insecure groups of mothers in this study, failed to do so. Why?

The confusion can be stated in yet another way, through a qualitative reading of the data of this study. If aversion to physical contact really serves to centrally delineate the avoidant/dismissing character - how can it be that O.'s mother turned out to be "preoccupied" in this study, and S.'s mother "dismissing"? Why were their expected behaviors reversed, with regards to physical behavior towards their infants?

Certainly, it must first be said that the small size of the sample in this study could itself account for the unexpected results that were obtained here. For that matter, all theoretical speculation offered here would best be served by replicating the procedures of this experiment with a larger sample, and applying conditions of scientific study.

The influence of sample size aside, it is possible that the findings on maternal availability patterns conflicted with the results reported by Hann et al. because there is not a precise correspondence between infant and maternal attachment classification all the time. After all, in the study that led Main and Goldwyn (in press) to report such a match, they discovered correspondence in 75% of their mother-infant dyads. That still leaves a substantial number who did not in fact match, and raises questions about the common tendency to talk about insecure infants and adults interchangeably - as, for example, in freely borrowing conclusions about avoidant infants and transposing them to their apparently dismissing mothers, or borrowing conclusions about resistant infants and transposing them to supposedly preoccupied mothers.

A more critical question yet introduces itself with regards to prediction in the study of attachment: how close is the fit between representation and behavior, within the case of the individual adult herself? After all, the internal working model, as we know it, is a broad and comprehensive representational system, whereas behavior is variable and discrete (Stern, 1985). A person's psyche may take more infinite, and ultimately more inexplicable form in the domain of behavior than in the indivisible domain of representation. In fact, some theorists believe that because of its episodic nature, behavior provides a less stable indication of attachment than underlying representation provides (Zeanah & Anders, 1987). Restating this in clinically familiar terms, it has often been seen that insecure mothers can manage to "pull" their behavior together and appear intact in the short run, but when these mothers are observed over time, their "episodes" of apparent health break down (D. Benoit, personal communication, March 26, 1990).

What if representation itself is in flux? It must be remembered that in this study, a woman's representational system was assessed, through the administration of the AAI, during the final trimester of pregnancy. Many would say that "state of

mind" is in transition, moreover even subject to actual crisis, at such a volatile time. Given that a woman's behavior was not sampled until fully a year later in this paradigm, it is possible that her state of mind also shifted, in acclimation to her pregnancy and subsequent childbirth. Did the reading of representation taken here, then, remain meaningful in light of this passage of time?

To resolve some of these questions, and to more closely trace the fit between representation and behavior, the author chose the cases of the two insecure mothers who were presented earlier in this section - especially since their conduct with their infants in our paradigm seemed to contradict understanding of their respective classifications. Their Adult Attachment Interviews were examined, and considered in light of their behavior with their infants. They will be discussed in succession here.

In the case of O.'s mother, telltale signs of an underlying preoccupied status surfaced early in her attachment interview, despite the fact that her behavior with her child had failed to reflect such leanings. In the matter of style alone, her responses were lengthy and confusing, creating a kind of incoherence that is common in preoccupied adults (according to guidelines furnished by Main and Goldwyn [1988]). In the content of her narrative, she described early experiences of role-reversal as a child, which are often thought to contribute to preoccupied attachment. Specifically, her parents' divorce and her mother's deep depression caused O.'s mother to feel protective towards her own mother when she was growing up. Her sense of having been abandoned as a child fueled her ongoing anger - also a feature of preoccupied attachment - which she often expressed in the present tense.

Not only did her preoccupied classification come to life, through the pages of her AAI, so too did her eerie physical aloofness from her child, exhibited throughout the robot paradigm. O.'s mother's remoteness, on display in our experiment, clearly had its origins in her own early childhood, as several different passages of her AAI

made clear, but none more tellingly than this. When asked what she did when she was upset as a girl, O.'s mother replied: "I'd go into myself"; when asked to elaborate further, she said, "I'd cry about it. Think about it. Eliminate." O.'s mother's defensive and ultimately punitive withdrawal was originally enacted against her two inadequate parents, but had become so integral a stance in her character, it was now undermining her empathic ties to her daughter, as seen so sadly in our paradigm. Though she had the self-awareness to predict, in her pregnancy, that parenting would call on her to make an effort to "counteract my own natural bent of being far away" - painfully for O., her mother had not yet mastered this challenge. For the purposes of the present discussion, however, it should be noted that in the case of O.'s mother, her behavior acquired clear rationale when traced to its source in representation.

Regarding S.'s mother, both her actual attachment classification - dismissing - and the seeming anomalies of her behavior in our paradigm were also explained through reference to her AAI. S.'s mother spoke with a kind of incoherence that often adorns the speech of dismissing individuals: her interview was rife with contradiction. Asked to provide adjectives that described her relationships with each of her parents, S.'s mother replied that her mother had been "caring" and "spiteful", and her father had been "loving" and "unavailable". The splitting and denial that underlie these individuals' strained attempts at idealization are hallmarks of dismissing organization (Main & Goldwyn, 1988). Elsewhere in her interview, S.'s mother acknowledged her feelings of "bitterness" towards her parents with chilly matter-of-factness; this intrapsychic capacity to put her parents "in their place" was also in keeping with dismissing organization. Finally, S.'s mother recounted early experiences of rejection, suffered whenever her own mother threatened to send her away, that are thought to figure prominently in dismissing attachment.

In light of the coolness of her own attachment history, how could S.'s mother offer easy, even cuddly physicality to S.? In her interview, conducted during pregnancy, S.'s mother supplied a ready explanation herself: she remarked that her own childhood had given her a need for "a lot more affection now as an adult, because I had such little affection as a child... I intend on hugging my kids a lot." The possibility that she might even overcompensate for her own early deprivation was also implied in her interview, when she repeatedly stated that she intended "to be totally involved with my children and know exactly where they are at all times... I intend on being there for my children all the time". The danger of "hovering" that is suggested in this insistent pledge is in fact realized, to some extent, in her interaction with S. in the robot paradigm.

Thus, the "state-to-behavior" link that was proposed by Main and Goldwyn (in press) when they first introduced the AAI was confirmed in the cases of these two insecure women, when their unlikely responses to their infants in our paradigm found compelling motivation in original representational form. Representation, then, stood the test, even when sampled during pregnancy. But if their own representations succeeded in accounting for the variance in their subsequent behavior, how was it that attachment theory, in general, seemed to fail to do the job?

This once again brings us back to the matter of prediction, and the two different courses that the process seems to take. In the case of secure attachment, prediction seems to entail almost foolproof precision; "reliability", after all, is itself definitional in the phenomenology of secure attachment. But predicting derivatives of insecure attachment seems bound to invite frustration or surprise. In particular, the form that availability ultimately took, in mothers who were classified as insecure in this study, turned out to be unpredictable and varied - even stubbornly against "type", in the cases of the two women who were presented here. The results on these measures point out the danger of giving "physicality", to name just one

example, to one insecure group or the other. A similar attempt at simplification was also defeated in the earlier discussion of infant affect, when anxiety and anger were judged not to have earned exclusive access to either insecure label. But attachment theorists themselves seem to feed the tendency to make insecurity comply with broad generalization.

For example, some observers feel that the authors of the AAI have taken too narrow a view of some of its subscales, in linking them exclusively with one insecure group or the other. To illustrate, why is the experience of "rejection" as a child primarily associated with dismissing organization, and the experience of "role reversal" as a child primarily associated with preoccupied organization? Can't early experiences of role-reversal and rejection both take up residence in a child's early development, and jointly leave their mark on subsequent character? (J. Crowell, personal communication, March 29, 1990). Isn't this one way of explaining the areas of overlap that are commonly observed in dismissing and preoccupied personalities? (J. Crowell, personal communication). O.'s mother, for one, seems to have suffered from both types of neglect, and may have fashioned from such complex slights, a preoccupied way of thinking and a dismissing style of behavior.

In psychoanalysis, as an alternative theory, a range of potential dysfunction is expected to coexist, within each individual psyche. Each person has the capacity for every defense, so a seeming merger of "dismissing" and "preoccupied" traits, within the personality of one individual, would pose no contradiction to an analytic observer. Both could be seen, in fact, as alternating responses to the same experience of deprivation, with distance employed in the dismissing response, and panic gaining precedence in the preoccupied response. This example only highlights a fundamental difference between attachment and psychoanalytic conceptions: the very effort to segregate the forces that commonly shape character, in such a psychoanalytic view, has always kept analysts cool to attachment theory.

Finally, in concluding this section, it must also be said that adult attachment theory lacks sufficient provision for individual difference. Like any developmental framework used to try to understand the evolution of character, attachment theory must be seen in interaction with the unique circumstances of an individual's life. Biological forces of gender and birth order, intrapsychic influences of wish and defense, social realities of environment and era - all play a role in shaping the unique course of one person's affiliative development, and his resulting attachment profile (Sroufe, 1983). To paraphrase Sroufe (1983), who has written of his own frustrated attempts to chart sequelae of insecure attachment, there simply is no "one" dismissing mother, no single version of preoccupied parenthood - no unitary portrait of secure mothers either, though here generality more safely applies.

In sum, adult attachment theory clearly offers insight into the early resources and deficits that can alternately feed strength and inadequacy in adult character. But to provide a more encompassing view of development, attachment theorists might profit from the perspective that informs the work of Anna Freud (1965) - who, while offering her own theoretical set of norms, never failed to recognize the "disharmonies" and "intricacies" inherent in development that could give rise to infinite "variations" in character as well (p. 107).

### III. Clinical Implications of this Study

The section of this study that treats the relation of attachment and affect carries clearest clinical implications, which have already received attention throughout the body of this paper, so will only be briefly discussed anew here.

In their respective models of attachment, both Kobak and Sroufe provide for the possibility that deviation will result in specific pathological outcomes. Kobak and Shaver's (1987) portrait of insecure individuals groping for security by adopting

different "strategies" and "styles of emotional communication" (pp. 4-5) leads them to speculate on the kinds of symptomatology that are likely to arise in the two insecure cases. Preoccupied individuals, they suggest, are likely to develop symptoms that feature heightened anxiety, such as phobias and conversion disorders, while dismissing individuals' need to mask emotion and project invulnerability could make them susceptible to conduct disorders.

More than merely speculate, Sroufe (1989) actually proves that early failure in "dyadic regulation" can account for later development of Attention Deficit/Hyperactivity Disorder. It may be recalled that in Sroufe's concept of insecure attachment, the caregiver fails in the first six months of an infant's life to "orchestrate" (p. 36) his exposure to fluctuating arousal, so that he lacks the capacity for self-regulation later on in his development when environmental demands on him greatly increase. Using home interaction measures based on Ainsworth's work, and starting as early as the age of six months, Sroufe was able to successfully predict the later appearance of AD/HD in children's elementary school years. Thus, Sroufe was able to use his ideas about the early infant-caregiver bond to roughly design an assessment procedure that could identify infants at risk of developing AD/HD well in advance of the actual manifestation of the syndrome. These efforts raise hopes that attachment theory can be similarly applied towards early detection of other clinical disturbances.

Pathways to specific disturbance aside, it is the way attachment theorists generally construe the emergence of character in early development, that lends itself most richly to clinical adaptation. To attachment theorists like Sroufe and Fleeson (1986), the behavioral organization that first emerges between infant and caregiver in the earliest months is the very "anlage of personality" (p. 51). In this view, the way in which the dyad negotiates early emotional challenge gives the infant a particular "self-environment" (p. 68) orientation, that becomes a facet of his

emerging self organization by the end of the first year of life. For a one-year-old like N., to take one example, dyadic organization has entailed the experience of fierce bonding in the face of arousal; thus, for N., conditions of heightened affect may always prompt a search for asylum through the protection of object ties. On the other hand, for a one-year-old like A., dyadic organization has notably failed to offer collaboration in encounters with arousal; as a result, for A., conditions of heightened affect may always stir a corresponding impulse to withdraw. The point is, say Sroufe and Fleeson, that patterns of the earliest dyadic organization endure in the character of the child himself, and are carried forward to new experiences and relationships. In fact, once internalized, these early relationship patterns prove to be highly durable, their very familiarity inviting continuity.

What mechanism, then, has the capacity to intervene, in the face of early relational power? Psychoanalysis is one such mechanism, because of its ability to reoccasion early dynamics in patients' lives, yet simultaneously facilitate a search for new forms of relatedness. In the same period of time in which attachment theory has risen to the fore of views of development, relational theories have gained importance in thinking about the process of psychoanalysis. As Mitchell (1988) explains recent currents in thinking from such a relational perspective, classical emphasis on insight and memory as the primary agents of change, has given way to a growing belief in the mutative potential of the relational work that transpires between patient and analyst.

The patient first seeks to structure his connection with the analyst "along old relational lines" (p. 292), in Mitchell's words; the phenomenon of transference itself attests to the perseverance of early relational patterns, invoked in theory by Sroufe and Fleeson. Although these old forms of connection arouse emotional pain, nonetheless the patient sets early attachments in motion because, as Mitchell points out, they are the only known avenues to object ties; surrendering them would require

that the patient accept the prospect of object loss, and aloneness as its intrapsychic outcome.

Yet the analyst offers another option. Contemporary relational trends in psychoanalysis have had the effect, according to Mitchell, of drawing the analyst in from the observational periphery of the analysand's experience, and positioning him more directly "within the analysand's relational matrix": "The struggle to find his way out, the collaborative effort of analyst and analysand to observe and understand these configurations and to discover other channels through which to engage each other, is the crucible of analytic change" (p. 292).

Even barring identification with "relational" schools of practice, certainly all psychoanalysts subscribe to the belief that the analyst offers the patient the opportunity to connect in new ways, and retrieve lost portions of self in the process (Mitchell, 1988). Stated in the terms of the present study, the analyst greets the patient's experience with different emotional responses, and works with the patient to bring into being an altered affective repertoire, absent its early limitations and bias. Intimacy with the analyst need not be upheld through a narrow and invariant set of emotional conditions. Rather, the analyst offers the patient the opportunity to venture new expressions of self, in the context of enduring connection.

Thus, the affective transactions that steer development, and were examined in this study, are called forth again in the analytic milieu and reworked by patient and analyst. The clinical value of this study is its locating the determinants of emotional health or maladaptation in the particular infant-caregiver organization that evolves by the end of the first year, under terms that are understood via models of attachment.

#### **IV. Limitations of this Study and Need for Further Research**

This study largely finds a place within the scientific tradition of "discovery research", insofar as it was guided by goals of uncovering meaningful patterns of mother-infant interaction, in the context of attachment organization (Grossmann & Grossmann, 1984). The dictates of proof, however, require further research. Towards that end, it is most important that the preliminary findings that were reported here be substantiated with larger subject pools.

Other ways of expanding the present methodology would also be useful to consider in the future. For example, concerning choice of subjects, it seems critical at this time for attachment theorists to broaden their understanding of the infant-father bond, which to date has been viewed to be organized independently from the bond between infant and mother (Main & Weston, 1981). Repeating this study with infants' mothers and fathers would potentially evoke the dual emotional realities in a child's development, with comparisons between maternal and paternal systems offering rich clinical material.

The measures that were used in the present study could also bear review. First, regarding infant affect, the scale that was used in this study produced global assessments of infant emotional states. It is possible that subtle affective distinctions among the three groups of infants eluded discovery using the ARS. As understanding of infant emotional life grows, more sophisticated tools for measuring affect continue to become available, and would be important to apply in replicating this study. Furthermore, because conditions in this paradigm favored a response set consisting primarily of interest, uncertainty, and fear, it would be valuable to design experimental conditions that could awaken a broader array of infant affect, so that a more thorough treatment of attachment and affect would become possible.

Other assessment approaches to maternal behavior also merit consideration here. The strength of the EAS, as a measuring device, is that it divides maternal behavior into discrete, component parts, and thus allows exposure of dimensions of behavior - physical, verbal - that may or may not be compatibly organized. It is possible, though, that in this approach, the qualitative "whole" of a mother's behavior may be to some extent sacrificed.

For example, in their study of mother-toddler interaction, viewed in the context of maternal attachment, Crowell and Feldman (1988) used a more qualitative approach to assessing maternal behavior. Their scales - actually borrowed from an earlier study by Matas, Arend, and Sroufe (1978) - measured mothers' "supportive presence" and "quality of assistance" on a series of problem-solving tasks that were beyond the capabilities of the children on their own. Subcriteria on these scales required qualitative assessment; for example, a mother was rated for her ability to be calm and enthusiastic while her child worked, to give her child space for independent discovery, to pace her suggestions so that her child would not flounder, and to foster a sense of achievement in her child.

Importantly, these qualitative ratings enabled Crowell and Feldman to uncover meaningful differences between the two insecure groups of mothers - a goal that was elusive in the present undertaking. The authors found that preoccupied mothers performed poorly on both "supportive presence" and "quality of assistance"; dismissing mothers, on the other hand, scored poorly on "supportive presence", but produced higher ratings on "quality of assistance". This led the authors to conclude that the dismissing character is able to summon strength in the performance of an instructional role, which may account for this group's appearance of intactness when observed in various kinds of task execution (J. Crowell, personal communication, March 28, 1990).

It seems, then, that the contextual meaning of a mother's behavior - even when judged subjectively - may contain important clues that help distinguish the two insecure kinds of characters. Alongside such measures as the EAS, it may thus be fruitful to provide for qualitative assessment of mother-infant interaction, in future research efforts designed to probe insecure attachment.

Finally, many ideas that are central in current thinking about attachment rest on the bedrock of the "state-to-behavior" link. Though this was hypothesized by Main and Goldwyn (in press) to explain the likely translation of an adult's representation into actual behavior, not enough research has yet been done to actually put this presumed connection to a test (D. Benoit, personal communication, March 26, 1990). Are representation and behavior congruent media? Does behavior honor or belie the inaccessible "state"? Like the effort only begun in the present study, more work is needed to carefully trace the connections between representation and behavior in individual functioning. Such research is a critical step towards understanding the process by which attachment is transmitted, from one generation to the next.

## V. Conclusion

This study was primarily undertaken to further understanding of the link between attachment and affect. By recasting attachment into recognizable affective phenomena, it was hoped that "security" and "insecurity" would cease to be merely developmental designations, and assume greater relevance to working clinicians.

This goal of the study was soundly realized. Though sample size was limited, flexible emotional life was found to be a distinguishing feature of secure attachment, seen in infants' responses to a charged stimulus in this study; access to affect was in varying ways more limited, in the dynamics that underlay insecurity

here. In the organization of insecure attachment, negative affect was found to play a problematic role. This was especially true in infants of preoccupied mothers, who struggled with anxiety in response to this experiment. But in some infants of dismissing mothers, the flatness of their response bespoke an absence of emotional choice, that included potential expression of negative affect as well.

Findings on maternal availability in this study complied less with initial expectation. Secure mothers exhibited consistent patterns of availability, generously supporting their infants in physical and verbal interaction. Preoccupied and dismissing mothers produced varying patterns of availability in their groups, thereby frustrating efforts to formulate these insecure phenomena in terms of uniform behavior. If the line between security and its absence was therefore clear, a finer grasp of the workings of the two insecure groups was not forthcoming from the results of the present study. The use of a larger sample, in replicating this effort, might shed further light on these findings.

The transmission of attachment from representation to behavior - within the individual adult, and, in turn, across generations - was also a process under review in this study. Closeness of fit between representation and behavior was particularly questioned in light of the uneven outcomes on maternal measures. Detailed examination of selected mothers, however, confirmed a correspondence between behavior and representation, in these individual cases.

The nature of the connection between representation and behavior should be the subject of further scientific study, for in their alliance lies the key to future applications of attachment theory.

## APPENDIX A

FAMILIARIZED ADULT STUDY  
AFFECT RATING SCALE, April, 1983

(Reliability 86%, perfect agreement)

4 High interest	Smiling (even slight), vocalization, demonstrative acts (kissing, patting, etc.), crawling toward (at least 2 full steps)
3 Medium interest	Some involvement with robot or toy, touching, concentration, focus, started crawling but not 2 steps
2 Low interest	Watching intermittently, pointing, lean toward, peeks at
1 Disinterest	Turning away, doing something else
0 Questioning/Orienting	Use only when referencing during whole 5 seconds
-1 Gaze aversion	Head down or away
-2 Nervous disruption	Nervous fidgeting, coughs, sighs, sucks thumb, walks in circles
-3 Cautious withdrawal/avoidance	Leans away, covers face, some bodily show of wariness (including fear face), extremely noticeable rapid breathing
-4 Clearly frightened	a. Flight or hiding b. Freeze c. Cries d. Aggression--push or kick robot

Between 1 & NS: If looks intermittently, then score 1; if between looks and does something else, score the greater.

## APPENDIX B

**AFFECT RATING SCALE - SUPPLEMENT**

## Adaptations to Naturalistic Robot Paradigm (1989)

- +4
  - See original, and:
  - Energetic approach towards robot that would equal 2 steps or more if mother didn't physically restrain.
  - Bouncing or rocking body, pumping arms or kicking legs in excitement.
  - Hands-on contact entire 5 secs.
  
- +3
  - See original, and:
  - Making concerted efforts to obtain full view of robot, despite mother's efforts to block access during prohibition part of sequence.
  - Mouthing part of robot.
  
- +2
  - See original.
  
- +1
  - See original.
  
- 0
  - Score only when referencing for entire 5 secs; if, after looking at mother, baby performs some reaction, score the reaction.

AFFECT RATING SCALE - SUPPLEMENT (1989)

continued

- 1 - See original.
- 2 - See original, and:
  - Fussing or distress in response to mother's prohibition.
  - Arms or fingers making jittery little movements.
  - Arms or fingers stiff and extended.
  - Nervous crawling around in circle or otherwise.
  - Self-soothing gestures like sucking thumb, e.g. sucking, embracing toy.
  - Tension or agitation that is not -3 or -4, but sufficient so that baby can't do something else.
- 3 - See original, and:
  - Holding onto, maintaining contact with mother with 1 hand, or in some other way. Can be scored in combination with touching, looking at robot. However, only give negative score if fear face or noticeable heavy breathing is in evidence.
- 4 - See original, and:
  - Clearly moves away from robot and towards mother for protection, or to hide.
  - Bids to be picked up or be held by mother, in fear; clinging to mother.

## APPENDIX C

Lisa Director  
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Clinical Psychology Program

Affect Rating Scale (Klinnert, 1983)  
Supplementary Training Manual & Specifications  
for Use with Naturalistic Robot Paradigm

### I. Intervals

#### A. Running Time

Intervals are 5 seconds each. The counters on the tapes are not uniformly the same, so intervals should be marked off on the counters in the following ways: on all pilot tapes, the counter is in minutes, seconds, and (30) frames, so a sample interval on these tapes would run from 15:20:00 to 15:24:29. On the actual tapes to be coded beyond the pilot stage, the counter takes two different forms. On some tapes, the counter is in minutes, seconds, and hundredths of seconds, so a sample interval on these tapes would run from 15:20:00 to 15:24:99. On other tapes, the counter is in hours, minutes, and seconds, so here the same interval would run, say, from 1:15:20 to 1:15:24. (The "1" designates the hour here.) In this last case, the interval should be considered over when the first video frame (using slow motion or frame advance) showing the counter time of 1:15: 25 appears.

The 6 minutes of infant affective behavior to be coded fall into 2 segments: the "prohibition" condition, in which the mother is instructed not to allow her child to play with the robot; and the "prohibition-lifted" condition, which commences when the mother is signaled by a knock on the one-way mirror to allow her child to play with the robot, if he so chooses. Each of these segments runs 3 minutes each.

#### B. Starting Time

Scoring will start in the "prohibition" segment with the first second that the mother turns on the robot. That is, the start time for the first interval of the first segment will be the first second in which the robot sound is heard.

Scoring in the "prohibition-lifted" segment should start with the first second in which the experimenter's "knocks" are heard, indicating that the prohibition has been lifted. Since this segment is joined continuously to the "prohibition" segment that precedes it, scoring should be continuous from the first to the second segment. However, it is important to record scores from the second segment under the heading on the scoresheet marked "prohibition lifted".

### C. End Time

Pilot tapes should be scored until 3 minutes are obtained, or until the experimenter is heard, concluding the segment, whichever comes first. (On these tapes, the experimenter can be heard, but not seen.)

On the 6-minute tapes, the second segment should be scored until the experimenter walks into the playroom and interrupts the action.

## II. General Principles of Scoring - "Best Fit"

The goal of coding is to award the single "best-fitting" score for an infant's behavior, in a given interval.

A. In most intervals, it is expected that the infant will perform behavior that readily matches the criteria of one particular dimension of the ARS and its Supplement. This manual provides further guidelines for selecting scores.

### B. Special Conditions

1. Intervals during which an infant performs behaviors that satisfy two different scale points on the same side of the scale

a. Score both behaviors, and select the "greater" positive or negative score, depending on which side of the scale is involved. This holds true whether the behaviors are performed simultaneously, or successively, in the interval.

Eg: (simultaneous) In an interval, an infant is sucking his thumb (-2), and at the same time crawling back cautiously from the robot in a gesture of retreat (-3): the interval would be scored -3 for the "greater" score.

Eg: (successive) At the start of an interval, an infant begins to crawl in the direction of the robot (+3), but then stops and points to it in a seeming signal to his mother behind him (+2): the interval would be scored +3 for the "greater" score.

b. Exceptions to the above rule: If changes in an infant's gaze behavior - i.e. his looking away from the robot or towards the robot - are the only behavioral phenomena noted in an interval, then a score should be awarded to that interval on the basis of the rules for scale points +3, +2, and +1, on pages 5-6, below. That is, such changes in an infant's gaze behavior alone during an interval should not be taken as an instance of "successive" behaviors, as described here.

Eg: Tape #4a, 18:47. An infant looks at the robot for 3 seconds, then at his mother for 2 seconds. He performs no other positive behaviors towards the robot, so he is given a +2 for the interval, because his gaze is off the robot for more than one second (p. 6).

However, if changes in gaze behavior are not the only positive behaviors in an interval, then score both the infant's gaze and non-gaze behaviors - and select the higher positive score.

Eg: Tape #4a, 18:32. During the first 3 seconds of this interval, an infant first looks at the robot, then at his mother, then back at the robot. For

this gaze behavior, the infant would be scored +2. In the last 2 seconds of the interval, the infant then touches the robot. This touching behavior is scored +3. The non-gaze behavior here receives a higher score (+3) than the gaze behavior (+2) - and the interval is scored +3.

2. Intervals during which an infant performs behaviors that satisfy two different scale points on opposite sides of the scale (i.e. positive and negative).
  - a. When these behaviors are successive, or when they overlap and one then succeeds the other, select the score that captures the state that the infant resolves himself in, by the end of the interval. (This rule also holds true when one of the successive scores is itself a "combination" score; see below.)  
Eg: Tape #6a, 20:11. An infant displays a fear face (-3) for approx. 2-3 seconds at the outset of the interval; his face then changes as he leans forward to watch in interest (+3) for the remainder of the interval as his mother plays with the robot's battery compartment. In this interval, the infant's varying affect is resolved into interest by the latter part of the interval - and the interval is scored +3.
  - b. If these behaviors occur simultaneously throughout the duration of the interval, also select the score that reflects the affective state (or "direction") that the infant is moving towards.
  - c. A "combination" score, consisting of the scores from both ends of the scale, should be given under the following circumstances: if an infant has initiated contact with his mother's body for protection or security, or a mother has made physical contact with her infant because of his distress, and at the same time, at any point in the same interval, the infant performs a "positive" behavior like pointing at the robot, reaching for the robot, vocalizing in excitement about the robot -- give a combination score to that interval, consisting of both the infant's "positive" and "negative" scores.  
Note: The "positive" behavior in a combination score needs to be more than mere gaze behavior.

### III. Miscellaneous Rules

#### A. Border Behavior

Any behavior that occurs on the border of an interval should be scored in the next interval.

#### B. Off Camera Activity, Short Intervals

1. If an infant's face is not visible to the camera at the moment the robot is first turned on, score is "N.S." (no score) until such time that you can see the infant's reaction.

2. If a child is not completely on-camera throughout the entire 5 seconds of an interval, score him on the basis of his behavior during the seconds when he can be seen.

If he is off-camera for the entire interval, score the interval "N.S."

3. If the robot wanders or falls off camera, but it is clear that the infant is looking at it or touching it, continue to score on the basis of these infant behaviors.

4. If an interval is less than 5 seconds, score it on the basis of the behavior that is noted during its duration.

#### IV. Specific Scale Points

##### A. Positive

##### 1. +4

If the infant performs any one of the behaviors in this category, it is sufficient to earn a +4. Thus a +4 in one infant may be earned through smiles, in another infant through shrieks, and in a third infant through his walking after the robot throughout the interval. Infants can earn a +4, or any particular scale point, in different ways. Further guidelines:

a. Smiling - is scored a +4 even if slight.

- In the case of slight smiling, it is important to review successive intervals on slow motion or frame advance to locate the onset and passage of the smile.

- If, because of the position of the infant's head, the clarity of a smile can not be made out with certainty, do not score for smiling.

- Smiling must be about the robot to be scored +4. That is, smiling that is in response to some other stimulus or play interaction would not, by itself, be scored +4.

b. Touching - needs to be contact for the entire 5 seconds (e.g. holding), or demonstrative contact (kissing, hugging) to be contact that is +4, not +3.

Note: if, because of the position of the infant's body, it is not possible to verify an infant's sustained touching of the robot for the full 5 seconds of an interval, the interval can not be scored +4.

c. Vocalization - though this characteristically is likely to be an excited squeal, any vocalization that is clearly about the robot earns a +4. If the squeal or other vocalization is not clearly about the robot, it can not be used to award a +4.

- If a vocalization begins while an infant is looking at the robot, and then continues while the infant turns away, for eg. to look at his mother, it will be considered about the robot; or, if the vocalization begins on the infant's turn away, it will also be considered about the robot.

- If an infant's vocalization about the robot continues beyond the duration of one interval, continue to score for the presence of the vocalization in the next interval.

- If there is a pause of at least 1 second after a vocalization, a second vocalization that then begins will be considered a separate vocalization.

d. Two full steps (prohibition-lifted segment) - the infant must walk/crawl 2 clear, full steps to get a +4. Note: the infant may take the 2 steps from a standing or resting position, or from having walked in a different direction in the preceding interval (for eg towards his mother). A "crawl" of 2 steps must be 2 full, forward steps; second "step" shouldn't simply bring infant's body into place.

- If it is not possible to ascertain clearly that the infant is taking 2 full steps, the behavior can't be used to score a +4. Eg: Tape #4a, 18:52. An infant seems to make a couple of small stutter steps, then lunges forward and falls towards the robot, with his arms reached out. His "steps" are difficult to discern, and the camera does not reveal his feet in this particular shot. Thus, because it is impossible to clearly ascertain the infant's two steps, he is scored +3 in this interval for his gaze, reaching, and "some" approach behavior.

- If, because of the robot's movement, or the infant's own unsteadiness, the infant appears to reposition himself vis a vis the robot, rather than move clearly towards it two-steps-or-more, this is not a +4. Similarly, circling the robot does not constitute a +4.

- It also may happen that a mother moves the robot to another place in the room, or the robot itself moves away, after the infant initially approaches it at the outset of the prohibition-lifted segment. If the infant walks or crawls at least 2 full steps to approach it again, he gets a +4 again.

- If a mother carries her infant up close to the robot, this would not qualify as a +4.

e. Two steps (prohibition segment) - if the infant makes 2 full, forward steps towards the robot before his mother restrains him, or if he energetically approaches the robot in such a way that would equal 2 steps forward if his mother did not intervene to physically restrain him, score +4.

f. Pumping arms or kicking legs in excitement; bouncing or rocking body in excitement.

- These behaviors must be about the robot to be scored +4.

- Arm pumping (or other behaviors listed above) that begins while the infant is looking at the robot, and then continues while the infant turns away, for example to look at his mother, will be considered about the robot; also, if the arm pumping begins on the infant's turn away, it will also be considered about the robot.

g. Note: when an infant earns a +4, he is usually looking at the robot throughout the entire interval. However, through the principle of "best fit," an infant can earn a +4 even if his gaze is not on the robot for the full 5 seconds, providing that one of the other +4 behaviors is clearly evident (for eg., squealing about the robot). See Pilot Tape #2a, 20:25, for eg.

## 2. +3

a. The modal +3 behavior is intent, concentrated gazing at the robot for all 5 seconds, or for 4 out of 5 seconds.

b. Other representative behaviors include:

- the act of reaching towards and/or briefly touching the robot (though not for the full 5 seconds); mouthing part of the robot (not for full 5 seconds).

- beginning to approach in crawl or walk, but not the clear 2 full steps required for a +4.
- c. Prohibition segment - The following behaviors would be scored +3:
  - Concerted efforts by an infant to obtain a sustained view of the robot, despite his mother's efforts to block his view or access. One key to awarding +3 to infant's gaze during the prohibition, is to see whether the infant switches focus off the robot, during his mother's efforts to interrupt or redirect his gaze. If he does not, sustained +3 gaze behavior is usually warranted.
  - An infant's lateral move, or effort to make a lateral move, around his mother's intentional "blockade" of the robot, is seen as a beginning approach to the robot, and is scored +3. An infant may also signal a beginning approach by reaching across his mother's lap or chest, until restrained. This is scored +3.

### 3. +2

This score can be earned in the following ways:

#### a. Gaze behavior

- If an interval is characterized by an infant's intermittent gaze behavior, directed at the robot. That is, if the infant begins the interval by looking at the robot, looks away at another toy, then looks back at the robot, this gets a +2. Thus, any back-and-forth gazing, directed at the robot, is scored a +2, however brief the gazing.
- If, from initially looking at the robot, an infant looks away at something else for more than one second. Thus, a potential +3 ("medium interest") becomes a +2 ("low interest") if the infant's gaze is taken off the robot for longer than 1 second.
- If, from initially being involved in other toys or play, the infant looks back at the robot at all. Thus, a potential +1 ("disinterest") becomes a +2 ("low interest") if the infant looks over at the robot at any point in the interval.

#### b. Non-gaze behavior

- Pointing, and leaning towards the robot are scored +2, in the absence of other "higher" behaviors like reaching for the robot, gazing at it intently, etc. (latter would be scored +3).

### 4. +1

- a. If the infant is involved is doing something else, playing with another toy, or looking at something else (though not his mother, as in referencing), for the entire 5 seconds, this is scored a +1.

#### b. Distinction +1 and +2:

If an infant's turning away from the robot occurs within the first second of an interval, and he stays uninvolved with it for the remaining seconds of the interval, this is scored a +1.

If at the outset of an interval, an infant looks at the robot for at least a second before turning away for the remaining seconds, this is scored a +2.

## 5. 0

a. This is scored when an infant looks at his mother for the entire 5 seconds, for or in seeming communication about the robot.

Eg: an infant, after pointing at the robot, turns and looks at his mother for the entire 5 seconds.

b. Note that this score should be given if the infant satisfies the condition of looking at his mother for the entire 5 seconds, and seems himself to be communicating about the robot.

Eg: infant turns from the robot, and looks at his mother for 5 seconds, while vocalizing insistently.

c. If an infant clearly demonstrates a lack of engagement with the robot for a substantial amount of time, and looks at his mother for 5 seconds over something clearly unrelated to the robot, this should be scored +1, not 0.

Eg: at the start of the "prohibition-lifted" segment, an infant looks at the robot for a few intervals, but then loses interest and becomes engaged in playing with a puppet. He does not renew active interest in the robot. In the course of playing with the puppet with his mother, he looks at her for 5 seconds. This would be scored a +1, since the referencing seems clearly unrelated to the robot.

d. 0 is scored only when an infant references his mother about the robot for the entire 5 secs. If, after looking at his mother, an infant performs some other behavior concerning the robot within the interval, 0 would not be scored.

## B. Negative

General: any physical contact made with a mother's body, initiated by an infant for security and/or protection, or initiated by a mother in response to an infant's distress, will be considered an indicator of negative affect.

Physical contact initiated by the infant or mother when the infant does not appear distressed or frightened will not by itself be considered an indicator of negative affect. For example, an infant may turn to his mother for contact during a playful interaction; or, a mother might hug or physically extend herself to her infant out of affection. In the absence of infant distress, these would not be scored as behavioral indicators of negative affect in the infant.

### 1. -4

a. Crying - continuous, or short bursts of crying sounds.

Note: whimpering, fussing sounds, and other vocalizations of distress are not automatically scored -4 as crying is. Such behaviors could be scored -2, -3, or theoretically -4, but must be evaluated in the context of other behavior in the interval in order to be scored.

b. Aggression - pushing, kicking, hitting robot; trying to knock it down, by himself or by throwing something.

c. Use of mother's body

- If an infant reaches for his mother or turns to her in an apparent bid to be picked up or held, this is scored -4. It is scored -4 even if the mother does not respond.

- If, while being held or embraced, an infant noticeably tightens his grip, or bids to be more tightly held (for e.g., by climbing up his mother's body), score this behavior -4.

- If an infant displays clinging behavior, score this -4. This includes clinging that can be seen in an infant's resistance to being put down, or a mother's inability to put him down.

**Note:** an infant's contact with his mother's body has to be seen clearly in order to be used as a criterion in scoring. If such contact can not be identified clearly, it can not be used as a factor in scoring.

d. Flight or hiding

- If an infant actively hides from the robot, score this -4.

- If an infant turns away from the robot and towards his mother for protection or to hide, score this -4.

e. Other

- Hands shaking in fear

2. -3

a. Cautious withdrawal - includes such behaviors as: an infant's backing up in apparent retreat from the robot; leaning away from the robot, including leaning towards his mother. An infant's move to withdraw may also be lateral, and not literally backwards.

b. Covering face

- If an infant tries to cover his eyes or ears, score this -3.

- If an infant buries his head in his mother's body in a deliberate effort not to see the robot, score this -3. (This, like attempts to cover the face, would be considered more forceful than simple gaze aversion.)

c. Cry face or fear face

- Components of fear face should be in accord with Izard, 1983, and Ekman & Friesen, 1975. Wide-opened eyes sometimes signal fear face on their own. See Tape #6, 22:26.

d. Extremely noticeable rapid breathing, or series of pronounced heavy breathing.

e. Use of mother's body

- If an infant reaches for his mother with one hand, or continues to hold onto some part of her body with one hand, score this -3.

- If an infant remains in his mother's embrace, after either he or she has initiated this contact because of his distress, score this continued contact -3. If the infant remains in or on her lap, out of initial distress, also score this -3. If the infant is seated on the floor in front of his mother, or is seated between her legs and is propped up against her, this is not scored -3 contact.

**Note,** distinctions -3 and -4:

- If an infant displays clinging in the way he holds onto his mother, this is scored -4.

- If an infant remains in his mother's embrace without apparent clinging or tightening of his grip for closer contact, score this -3.
- If an infant resists being put down and his mother can not put him down, score this -4.
- If a mother is able to shift her infant onto one side of her body or her knee or lap, score this -3.

**Note:** An infant's use of his mother's body must be seen clearly in order to be used as a criterion in scoring. If his contact with her body can not be identified clearly, it can not be used as a factor in scoring.

### 3. **-2**

- a. Hands or fingers making jittery, little movements; arms, hands, or fingers stiff and extended in display of tension.
- b. Other instances of nervous behavior - examples include: rocking body in agitated manner, nervous crawling or walking around in circle or otherwise.
- c. Sighing
  - A sigh is likely to occur singly, as opposed to a series of rapid or heavy breathing (latter is scored -3). Eg. of sigh: Tape #6, 19:51.
- d. Worry face - eyebrows raised, usually pulled close together, causing appearance of furrowed brow. If worry face is not clearly indicated, other behavioral indicators must be present in order to score -2.
- e. Self-soothing gestures - sucking thumb; mouthing several fingers; mouthing toy or embracing toy in self-soothing gesture.
  - Note:** if an infant plays with a toy or otherwise handles it, rather than embracing it in an act of apparent self-soothing, this is not scored -2.
- f. Tension or agitation that is not -3 or -4, but is sufficient so that an infant can not mobilize himself to turn to something else, play with something else, etc.
- g. Fussing or distress in response to mother's prohibition.

### 4. **-1**

Gaze aversion - infant turns head down or away from the robot.

**Note:** in order to score -1, the infant's head-turning should be seen as an effort to block out the stimulus out of fear or aversion. Thus, if an infant turns away because other stimuli draw his attention, or because his interest in the robot is flagging, etc., such gaze behavior would be scored on the positive end of this scale.

## APPENDIX D

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## EMOTIONAL AVAILABILITY SCALE

6 to 30 months

(J.D. Osofsky, A.M. Culp, A. Eberhart-Wright, D.M. Hann)

Through the concept of emotional availability the mother or caregiver acts as a "beacon of orientation" from whom the child receives information. This information provides the child with confidence to continue to explore and play. Emotional availability measures the mother's accessibility to her child. Attention is given to the mother at all times, especially when her child is expressing an emotion or giving a cue that he/she needs attention. The mother is most available when she contingently and appropriately responds to her child.

Emotional availability is measured in several domains: visual regard, physical contact and talking. Both the child and mother are scored for each domain. The child is scored according to whether or not a cue from that domain was observed. For the mother, rating scales have been developed giving a score of 1 to 5 ranging from no availability to a high level of availability. In general, a score of either 1 or 5 measures the mother's reciprocal responsiveness to her child. A score of 2 indicates the mother's functional availability. A score of 4 indicates mother's initiative in signaling her availability. A score of 3 indicates a mixture or middle ground. Each score represents the best performance observed.

In addition, affect exchanges are scored according to the facial and vocal expressions of the mother and child. Several

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categories of affect exchange have been devised based on the presence or absence of positive/negative expressions. The affect exchange categories are as follows: none, positive, negative, mixed-appropriate, mixed-questionable, one-way mother, one-way child, and simultaneous no exchange.

Both the emotional availability domains and affect exchanges are rated across six mother-child situations: attachment (A), feeding (F), social referencing (SR), prohibition (PR), and empathy (E). (Definitions of these situations are listed in Table 1). Each situation is divided into consecutive 15 second intervals with behaviors occurring at the boarder second scored in the next interval. Scoring the intervals requires that mother and child be visible on the videotape. Intervals in which both the mother and child are off-camera should be indicated by placing an \* by the last scored interval. Should more than one consecutive interval be unscorable, the number of omitted intervals should be indicated by the \*. Due to this procedure, the length of the observation period for each situation may vary in order for the required number of 15 second intervals to be scored. (Example: During the feeding situation, 21 intervals were observed, but 3 intervals were unscorable).

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## EMOTIONAL AVAILABILITY DOMAINS

I. VISUAL REGARD

A. Child - This domain is scored if at any time during the interval, the child looks at the mother. One must be able to view the child's open eye in full-face or profile and the mother must be on camera in order to determine if the line of vision is directed at the mother.

B. Mother - Ratings of this domain pertain to the quality of visual regard displayed by the mother towards the child. The mother's open eye in full-face or profile must be in view in order to determine the line of vision.

1. Avoidance - The mother avoids the child's attempts to look at her.

Example: The child glances at mother several times, but mother never looks in the child's direction.

2. Questionable looking - Dazed looking in the direction of the child.

Example: Mother is staring in the direction of the child, but appears preoccupied or 'spaced out'.

3. Inconsistent visual regard - Mother looks at the child but glances away for no specified reason OR glance away for a specified reason but does not resume looking at the child. (Specified reasons for looking away include attendance to caregiving tasks, toys shared with the child, and/or conversations with other adults.)

Example: Mother glances at the child playing with a toy, then looks down at another nearby toy.

4. Prolonged visual regard - Mother looks at the child for greater than 5 seconds OR mother glances more than once at the child while attending to caregiving tasks, shared toys or conversation with adults.

Example: Mother looks at the child for 8 second OR Mother glances at the child, then at the juice she is pouring. Near the end of the interval, she glances back at the child.

5. Reciprocal visual regard - The child looks at mother and mother looks at the child. If the child breaks the look, mother follows by not looking. Similarly, if the child resumes looking, mother resumes looking at the child. Should mother not break and/or resume looking, she cannot be scored a 5.

Example: Mother and child look at each other. The child looks at a toy and mother then looks down at her fingers. When the child looks back at her, she looks back at the child.

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**II. PHYSICAL CONTACT**

A. Child - Scored if the child elicits any of the following physical contact cues to the mother: the act of touching, reaching, leaning, approaching, tugging, showing/giving an object and affectionate, neutral or aversive contact. Sustained touching, leaning, and/or sitting is not scored as a child cue.

B. Mother - Scored on the basis of the mother's nonresistance to physical contact. How much does she touch, hold, act affectionately towards her child. Although older children are less likely to be held, when the opportunity arises, does the mother offer contact freely or show resistance in varying degrees?

1. Ignore - When the child elicits a physical contact cue the mother either does not respond with physical contact OR she physically withdraws from the child.

Example: (A) While seated on the floor, the child reaches up to mother. Mother continues to stare down at the floor OR actively turns away from the child; (B) Child reaches for a toy and the mother moves the toy out of reach.

2. Functional contact - Mother comes into physical contact with the child only to complete some caretaking task and/or physically aid the child to complete a task. This score also is given for all cases of maternal aversive physical contact.

Example: (A) Mother wipes the child's face and hands; (B) Mother takes the child's hand in order to get him/her to the table for snack; (C) Mother swats the child's behind; (D) Mother takes an object from the child without a child giving cue; (E) Mother purposely prods or hits child with a toy/object.

3. Hold - Mother chooses to hold or carry the child but offers no affectionate contact, i.e., she is more like a chair. This score also applies to instances in which the mother passively accepts physical contact from the child.

Example: (A) Mother has the child on her lap but does not caress or hug.

4. Nonfunctional contact - Mother displays nonfunctional physical contact (i.e., affectionate contact) in the absence of a physical contact cue from the child.

Example: (A) While the child plays with a toy on the floor, mother reaches over and rubs his/her head; (B) Mother tickles the child with a stuffed animal.

5. Reciprocal physical contact - Mother responds with nonaversive physical contact to a child's physical contact cue. If mother responds with functional or aversive contact she cannot be scored a 5 (see level 2).

Example: (A) Child reaches towards the mother and mother picks-up the child; (B) Child hits the mother and mother responds by picking-up and hugging the child.

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### III. TALKING

A. Child - Scored if the child elicits vocal sounds\* (coos, laughs, screams, whimpers, cries), words or communicative gestures, i.e., nodding or shaking the head. (\*Vocal sounds do not include burps, sneezes or coughs.)

B. Mother - Rated on the quality of talking offered to the child. Lower ratings involve directive forms of talking, i.e., talking that only tells the child what to do. Higher ratings reflect speech that describes and/or explains events to the child.

1. Quiet - Mother does not respond verbally to child's vocal sounds, words or communicative gestures.

Example: Child coos and laughs at a toy while mother remains quiet.

2. Directed talking - Mother gives the child directions without providing any meaning to the child's experience. Also score this level for any instance of unintelligible speech or aversive talking. Aversive talking may refer to the tone of speech as well as the words chosen.

Example: (A) Sit down!; (B) Push it; (C) See! or Lookee!; (D) No, you can't have it; (E) Do you want a whipping?; (F) saying babies name.

3. Expressive talking - Mother gives meaning to the child's experience by labeling objects, explaining activities, singing, making toy noises and/or providing exclamations. This rating is given to talking not scorable as 2 or 4.

Example: (A) Here's your juice; (B) That's a pretty toy; (C) No no, that's not a good idea. We could hurt ourselves; (D) Yeah, that's a good boy.

4. Interrogative talking - Mother asks the child a question in a nonaversive or nonthreatening tone.

Example: Does the baby want a cookie?

5. Reciprocal talking - Mother responds with nondirective talking (see 2) to a child verbal cue. This includes verbal imitation as long as the imitation is not of an aversive child cue.

Example: Child coos while playing with a toy dog and mother says: "Yes, that's a doggie."

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## AFFECT EXCHANGES

Affect exchanges may occur when a mother and child look, touch and/or talk to each other. Scoring the exchanges involves determining the affective tone of their interaction. Four types of exchanges, or interactions, are possible: positive, negative, mixed appropriate, and mixed questionable. When the exchange involves talking remember that tone of voice takes precedence over words that are spoken. A fun-loving mother may say: "Oh, you are a mess;" or " Oh, you are so bad" but because of the fun-loving nature, the mother would be considered to be positively vocalizing rather than negatively vocalizing.

In addition to the exchange codes, codings have been included to describe intervals in which no exchange occurred (None), only one member of the dyad expressed positive/negative affect (One-Way), or both mother and child emitted some form of affect but not to each other (Simultaneous No-Exchange).

As with the emotional availability domains, the mother and/or child must be seen on camera in order to score the affect exchanges. For the child, all emotional expressions should be scored. However, for the mothers emotional expressions clearly directed to another individual are not scored. Similarly, consecutive 15 second intervals are used with omitted intervals indicated with \* next to the interval last seen. Unlike the emotional availability domains, scoring affect exchanges may involve viewing a few second of the next interval. Specifically, if an "exchange" begins on the thirteenth or fourteenth second of the interval, continue to look for 2 more seconds in order to determine the correct affective tone.

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## DEFINITIONS OF AFFECT EXCHANGES

I. None - No exchanges are observed.

II. Positive Affect Exchanges - This occurs when the mother and child interact with each other and both display either positive facial expressions or positive vocal expressions.

Example: The child laughs and the mother either laughs, smiles, or says something positive (e.g., praise, affectionate expressions).

III. Negative Affect Exchanges - This occurs when the mother and child interact with one another and both display either negative facial expressions and/or negative vocal expressions.

Example: The child is crying and the mother says: "Shut up" or says: "No you little brat."

IV. Mixed Affect Exchanges: Appropriate - The mother and child exchange facial and/or vocal expressions that do not convey the same kind of emotion but the exchange appears appropriate.

Example: The child is crying and the mother is comforting him/her with a smile on her face.

V. Mixed Affect Exchanges: Questionable - The mother and child exchange facial and/or vocal expressions that are mixed but do not appear to be appropriate (see IV). The exchange does not appear to make sense.

Example: (A) The child is crying and the mother laughs; (B) The mother reprimands the child and the child laughs.

VI. One-Way Mother - An emotional expression is emitted by the mother but the child makes no positive or negative response. The child may or may not be looking in the direction of the mother. The observer is asked to record the tone of the mother's expression with a "+" for positive and a "-" for negative.

Example: Mother smiles at the child but the child is busy playing with a toy and does not look in mother's direction.

VII. One-Way Child - An emotional expression is emitted by the child but the mother makes no positive or negative response. The mother may or may not be looking in the direction of the child. The observer is asked to record the tone of the child's expression with a "+" for positive and a "-" for negative.

Example: While looking at mother, the child coos and smiles. Mother continues to look at a magazine.

VIII. Simultaneous No-Exchange - Both the mother and child are expressing an emotion but there is no exchange between them. This also is reserved for the mother or child who seem "to be in their own world," i.e., expressing emotions in a noncontingent manner.

Example: While reading a book the mother smiles. At the same time, the child laughs at a toy.

## APPENDIX E

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Emotional Availability Scale (Osofsky, Culp, Eberhart-Wright, & Hann, 1987):  
Specifications for Use with Robot Paradigm & Supplementary Guidelines

I. Intervals

A. Running Time

Intervals are 10 seconds each. The counters on the tapes are not uniformly the same, so intervals should be marked off on the counters in the following ways: on all pilot tapes, the counter is in minutes, seconds, and (30)frames, so a sample interval on these tapes would run from 15:20:00 to 15:29:29. On the actual tapes to be coded beyond the pilot stage, the counter takes two different forms. On some tapes, the counter is in minutes, seconds, and hundredths of seconds, so a sample interval on these tapes would run from 15:20:00 to 15:29:99. On other tapes, the counter is in hours, minutes, and seconds, so here the same interval would run, say, from 1:15:20 to 1:15:29. (The "1" designates the hour here.) In this last case, the interval should be considered over when the first video frame (using slow motion or frame advance) showing the counter time of 1:15:30 appears.

The 6 minutes of mother-infant interaction that will be coded fall into 2 segments: the "prohibition" condition, in which the mother is instructed not to allow her child to play with the robot; and the "prohibition-lifted" condition, which commences when the mother is signaled by a knock on the one-way mirror to allow her child to play with the robot, if he so chooses. Each of these 2 segments runs 3 minutes each.

The pilot tapes are only 3 minutes long, and have no prohibition segment (i.e. the child is allowed access to robot.)

B. Starting Time

Scoring will start in the "prohibition" segment with the first second that the mother turns on the robot. That is, the start time for the first interval of the first segment will be the first second in which the robot sound is heard.

Scoring in the "prohibition-lifted" segment should start with the first second in which the experimenter's "knocks" are heard, indicating that the prohibition has been lifted. Since this segment is joined continuously to the "prohibition" segment that precedes it, scoring should be continuous from the first to the second segment. However, two separate scoresheets should be used to code the "prohibition" and "prohibition-lifted" segments.

### C. End Time

Pilot tapes should be scored until 3 minutes are obtained, or until the experimenter's voice is heard, concluding the segment, whichever comes first. (On these tapes, the experimenter can be heard, but not seen.)

On the 6-minute tapes, the second segment should be scored until the experimenter walks into the playroom and interrupts the action.

### D. Placement of Score: "Border" Scores and "Split" Cue and Response

1. If behavior occurs on the border of 2 intervals, it is scored in the 2nd of these 2 intervals.

2. Vocal & Physical Domains: if a child cue occurs within the last 2 seconds of an interval, and the mother's response does not occur until the next interval, score both the child's cue and the mother's response in the second of the two intervals. Eg: within the last 2 seconds of an interval, a child vocalizes as he plays with a rattle. In the opening seconds of the next interval, his mother says, "Yeah! You like that rattle." This would be scored /5 in the 2nd of the 2 intervals, in the vocal domain. Note that if this were the only vocal behavior that had occurred in the 1st of the two intervals, "no" vocal behavior would be marked off in the 1st interval.

If a child's cue occurs earlier than the last 2 seconds of the interval, it is scored in the interval in which it occurs, even if the mother's response comes in the next interval. Note that in this situation, the mother would be scored /1 in the first interval, and her response would be scored in the next interval without a child cue.

3. Affect Exchange: if a child produces an affect cue within the last 2 seconds of an interval, and the mother's response does not occur until the opening seconds of the next interval, score the entire affect exchange in the 2nd of the 2 intervals. In other words, if it is necessary to view the opening seconds of a 2nd interval in order to determine whether an infant cue is going to be answered by a mother so as to make it a "positive affect" exchange, a "mixed appropriate" exchange, or a "mixed questionable" exchange, then the entire affect exchange should be scored in the 2nd interval. Eg: an infant cries within the last 2 seconds of an interval, and his mother soothes him in the opening seconds of the following interval. This would be scored a "mixed appropriate" exchange in the 2nd of the 2 intervals. In this case, if this were the only affect activity in the 1st of the 2 intervals, "none" would be checked off in that interval.

If, though, either a mother or an infant produces a "one-way" affect cue within the closing seconds of an interval, it should be scored within the interval in which it occurs. Eg: child smiles at a toy he is playing with in the last 2 seconds of an interval, while mother watches quietly, with neutral expression. Score "one-way positive, child", in the interval in which it occurs.

Finally, if a dyadic affect exchange is scored in one interval, and only one partner continues to emit an affect signal in the following interval, the appropriate "one-way" score should be scored in the 2nd of the 2 intervals. Eg: in one interval, a child whimpers in distress, and his mother smiles in response, indicating a "mixed questionable" exchange in that interval. In the next interval, the child stops whimpering, but the mother continues smiling. This would be scored "one-way positive, mother" in the 2nd of the 2 intervals.

## II. Criteria for Specific Scores

### A. /5

/5 is given in the vocal and physical domains if the child emits a cue and the mother produces a response at any subsequent point in the interval, that is not a 2 response.

Note that if the child emits a cue, and the mother responds with a 3 or 4 response, the score and response automatically become /5.

### B. /3 and /4 are scores that could result in an interval if:

1. the mother's behavior (3 or 4) precedes the child's cue (/) in an interval
2. the mother produces more than one score in an interval, and the "best" score she receives is /3 or /4.

Eg: mother asks her child a question at the start of an interval, then fails to reply to his vocalization a few seconds later. For this, she would receive scores of 4 and /1 respectively, which would result in her getting the "highest" score of /4 for the interval.

## III. The Physical Domain

### A. Infant propped up from behind

If a mother is seated on the floor with her legs in a v-shape, and is propping infant up with her body in this position, score the contact 2.

If mother in this position is not making contact with the child, it is not scored as physical contact.

If mother, from this position, offers loving contact with the child, her response should be scored 4 for these behaviors. Egs of this: mother leaning down to nuzzle child's face with her own; mother wrapping arms affectionately around infant's neck.

### B. Distinctions between "2" and "3" in physical contact

Sometimes, from a seated position on the floor, a mother will help her child to stand up. The following acts would be scored 2 in physical contact: assisting the child to his feet; holding onto the child's hand, arm, etc. with one hand to ensure his steadiness; supporting child from behind with one hand.

If, however, while a child is standing, a mother has both arms around him in a gesture more nearly like a "hold", this would be scored 3.

### C. Cueing during interludes of sustained holding

During sustained holding of a child by his mother that lasts longer than one interval, continue to score the mother for the nature of her physical contact for however many intervals it lasts.

However, during instances of sustained holding, the child does not continue to get scored as providing a cue - unless he performs some change in behavior or gesture that indicates a new cue. Eg: a child, while being held over his mother's shoulder, reaches for her neck to be held closer. Note: if the child merely tightens his grip on his mother, it is not enough to be scored as another cue. Child must lose contact with mother momentarily and then reissue cue, or produce some new gesture like grabbing onto another part of mother's body, in order to be scored as producing another cue.

#### D. Approaching and reaching behavior

A child's approaching an object, by itself, is not sufficient to be scored a cue in the physical domain. The child must perform some additional behavior - that is, reaching behavior with arms or body - AND he must either explicitly or implicitly direct his cue to his mother, in order for it to be scored a "cue" in the physical domain. Egs:

- a. A child reaches out to play with a ball, a rattle, or the robot on his own. Because the child's play is not interactive with the mother, and he is not asking anything of her, his behavior would not be scored as a cue in the physical domain.
- b. A child begins to crawl towards the robot, and his mother moves the robot further away. This would also receive no score for infant or mother, because the child's crawl alone, without "reaching" behavior, is not sufficient to be considered a cue.
- c. A child sits in his mother's lap, and strains to reach a punchboard on the floor in front of him. Seeing him reach forward in effort, his mother brings the punchboard closer so he can touch it. This would be scored /5.

#### E. Offering and giving

If a mother offers her child something - for e.g., a book or a toy - and her child signifies his interest by reaching towards it, and then the mother completes the exchange by giving the child the object, this is usually scored /5.

However, if a child simply takes something that is lying in his mother's lap, this is not scored as a "cue" or a "response". Or, if a mother is simply holding something in place - for e.g., a punchboard - so her child can play with it comfortably, this would not be considered a "/5" exchange -- unless the child cued the mother to bring it closer or assist him in some other way.

#### F. Distinctions between /1 and 2

##### 1. Reaching for an object v. contact with an object:

If a child reaches for an object, and his mother removes the object from his reach, it is scored /1. Note that /1 is scored if a child reaches for the robot and, as per the instruction in the "prohibition" segment, his mother removes it from his reach.

If a child already is in contact with an object (for eg., the robot), and his mother removes it from his contact, it is scored 2.

In the case of the /1, the child has not yet made contact with the object; in the case of the 2, the child already has made contact with it.

2. **Mother's physical restraint of child from robot, as instructed:**

Eg: Infant begins to crawl towards the robot during the prohibition segment, and mother grabs onto the infant to prevent him from approaching it. Or, mother picks infant up and repositions him, or herself, to keep him from robot. Both examples are seen as "functional contact", and are scored 2.

3. **Summary: possible physical behaviors during "prohibition" segment:**

- a. If infant reaches for the robot, and mother removes robot: /1.
- b. If infant grabs onto robot, and mother takes it out of his hands: 2.
- c. If infant begins to crawl towards robot (no reach), and mother removes robot: no score.
- d. If infant begins to crawl towards robot, and mother picks infant up and puts him on her lap: 2.
- e. If infant begins to reach for the robot, and mother picks infant up and puts him on her lap: /2.

G. **Other repositioning of child**

If on her own, a mother repositions an infant's body so he faces the camera, as she was instructed, this is seen as "functional contact", and is scored a 2.

If an experimenter enters the room to repeat this instruction to the mother, do not score the mother's repositioning of the child.

H. **Facilitating a child's passage**

If, without a child cue, a mother clears toys out of a child's path in order to facilitate his crawling or walking, this gets no score.

I. **Miscellaneous notes on specific scores**

1. /5:

If a child cues his mother to provide a "functional" response, and mother responds appropriately, the exchange is considered /5. Cues can be subtle, for e.g.:

- a. A child lying in his mother's lap opens his mouth and purses his lips in a bid to be fed. Mother responds by placing bottle in his mouth. This is scored /5.
- b. An infant squirms on his mother's lap, in an effort to get onto the ground. Mother responds by lifting child off her lap and onto the floor. This is scored /5.

2. 4:

Rubbing, or soothingly patting an infant's back or bottom is scored 4. However, patting an infant's back in order to burp him is scored 2.

IV. **The Vocal Domain**

A. **Vocal statements that straddle 2 intervals**

A mother's comment should only be scored once, in a single interval.

So, if a mother begins a comment to her child in one interval, and the last few words extend into the next interval, score the entire statement in the first interval.

Even if you need to listen to the last word or two to determine that the mother's comment is a question, score the question in the first of the two intervals. Note: in this example., if the mother said nothing more in the second of the two intervals, she'd be marked for "no" talking in the second of the two intervals.

### B. Pointing and nodding

1. A child's pointing at an object will always be scored a cue in the vocal domain.

To get a /5, the mother must acknowledge that object in her response. If she fails to acknowledge that object but does respond, she will get a /2, /3, or /4, depending on the nature of her response. If she doesn't respond to the child's pointing, it is a /1.

2. If mother or infant nod or shake head in communication with the other, this is considered vocal behavior.

### C. Reading

If a mother reads a book to her child, score her on the basis of the text she is reading in a given interval. If she reads text that is expressive, score her reading a

3. Eg: "'This little piggy went to market.'" If she reads text that is interrogative, score her reading a 4. Eg: "And Big Bird said, 'Can I go with you?'"

### D. Unintelligible speech

1. This category of behavior is scored 2.

Egs include: instances when a mother's speech is too mumbly to be heard; instances when a mother speaks too quietly to her child for the microphone to pick it up well.

Note: if you find yourself replaying a segment several times, and still can't make out anything that is said, this is a criterion for scoring "2".


2. If a mother talks in a foreign language to her child that the coders don't understand, this can not be scored.

### E. Inferring "expressive" or "interrogative" speech

If some of a mother's words to her child are unintelligible, but enough of a statement is heard and understood to qualify the statement as expressive (because mother labels or explains), or interrogative (mother asks), the statement should accordingly be scored a 3 or 4.

### F. Interrogative speech

A mother's interrogative speech to her child is usually signified in the following ways:

a. Use of a clearly questioning, rising tone of voice. Eg: "Wanna go look at it?" 

b. Use of interrogative terminology. Eg: "Do you wanna go look at it?"

c. Use of an interrogative expression like "huh" at the end of a comment, to turn it into a question. Egs: "You wanna go look at it, huh?" "You're gonna play with the truck, huh?"

However, if mother does not use interrogative words at the start or end of her comment, and her voice does not rise in questioning tone, her comment will remain "expressive" (3).

#### G. Directive or aversive speech

1. 2 is scored if a mother calls out her child's name directly, or to otherwise command her child's attention.

Eg: A child makes fussing sounds, and her mother responds impatiently by calling out her name: "Mary!" This would be scored /2.

However, if a mother uses her child's name in a nondirective way, it could be scored 3 or /5. Eg: a child whimpers, and her mother acknowledges her distress by saying her name sympathetically: "Oh.... Mary....". This would be scored /5.

2. Pure directives are scored 2.

Egs: "Don't!" "Watch out!" "See/Lookee"

However, further labeling of the child's experience would produce a "3".

Egs: "Don't eat the book." Or, "Don't eat it." Or, "Watch out for the robot!" -- all would be scored 3.

3. A clearly hostile or sarcastic comment is seen as aversive talking. It is scored as negative affect under affect exchange, and as "2" in the vocal domain.

#### H. Scoring of specific sounds and comments

##### 1. Mother

Mother's laughter= 3.

Mother's meaningful vocalization, along the lines of "Hmmm..." or "Hmmm?" = 3

"Oops!" and "Uh-oh!", and other mild exclamations = 3.

If the only vocalization a mother utters in an interval is "No" or "Yes", this is scored 3. Note: "No" and "yes" are scored 3 even if asked in a questioning way. For example, a mother may ask her child a question in one interval - "Wanna go play with it now?" - and then, when the infant doesn't indicate a reply, the mother may prompt her child by saying, in the next interval, "No?" The first interval here would be scored 4, and the second interval 3.

Comments made by the mother to prohibit her child from playing with the robot are seen as explanatory and are scored "3". Eg: "You're not allowed to play with him yet."

Words, laughter, or other vocal sounds that are directed to an experimenter are not scored.

##### 2. Child

Heavy breathing is not considered a cue.

Sighing is usually considered a cue, depending on context. If it is clearly expressive and seems to be the continuation of crying, it is scored as a cue.

However, if it seems more like heavy breathing, or lacks clearcut expressive tone, do not score as cue.

## V. Affect Exchanges

### A. General rules

1. More than one type of affect exchange can be checked off during a single interval.

However, a single type of affect exchange should only be checked once during an interval. That is, even if an infant seems to smile at a toy two separate times during an interval, "one way positive, child" would only be checked once.

2. A "positive" or "negative" exchange must center around an interaction between mother and child. Usually mother and child are looking at each other; in a positive exchange, for eg., they are smiling at each other in shared enjoyment over an object or event.

In a "one-way" affective event, the affect is not explicitly shared with the other person. An infant who smiles by himself at a toy he approaches, or a mother who smiles at her infant's play from behind his back, would each be scored "one-way positive". In fact, if a mother and infant both independently smile at a new toy that has been introduced to a playroom-- without looking at each other to exchange and share smiles -- two one-way positives would be scored.

Note, however, that a "mixed appropriate" or "mixed questionable" exchange can be scored on the basis of a mother's response to her infant's distress, even if the mother does not exchange looks with her child in the process.

### B. Specific behavioral criteria for affect exchanges

#### 1. Positive affect

##### a. Mother

Smile, laugh.

Praise of child (i.e. content of what mother says). Egs: "Good!" "Good girl." "That's my boy!"

Use of affectionate terms like "honey", "sweetie pie", etc.

Not scored as affect: hugs, kisses; exclamation like "Yay!" - unless accompanied by smile or other sign of positive affect.

##### b. Child

Smile, laugh.

Child's coo or gurgle may be scored as positive affect, if it clearly conveys a happy tone. Look for accompanying facial expression.

Not scored as affect: squealing in excitement, pumping arms or legs in excitement.

#### 2. Negative affect

##### a. Mother

(1) Disapproval or hostility conveyed in content or tone.

Eg: Mother snaps at child, "That was a stupid thing to do." Or, mother says to child curtly, "You're really getting on my nerves today."

(2) Use of mocking or menacing tone in play or interaction.

Eg: Mother says, "Teddy Bear is going to bite you!" in a tone that could sound menacing, rather than playful, to the child.

(3) Frightening content or tone.

Eg: Mother says to child lying on the floor, "You're dead!"

b. Child

(1) Crying, whimpering, whining.

(2) Fussing, and other distress sounds.

(3) Cry face, clearcut fear face. More subtly, if infant's brows are knitted together, and the emerging distress on his face represents a change from previous interval, this may also qualify as negative affect. However, if the signs are at all questionable or unclear, do not score as negative affect.

Not scored as affect: sucking thumb, rocking body, or hugging mother out of apparent distress - unless accompanied by other facial or vocal signs.

3. Mixed appropriate and mixed questionable

a. Mixed appropriate - If in response to a child's distress, a mother is loving and/or soothing in verbal tone, the interval is scored as "mixed appropriate".

The content alone of a mother's verbal response to her child's distress may warrant scoring as "mixed appropriate". For example, if an infant is crying in fear of an unfamiliar toy (e.g., robot), and his mother states, "Okay, I'm going to take it away now" - her words here indicate an appropriate attempt to mollify her child, and would likely be scored "mixed appropriate".

Note, however, that a mother's loving tone by itself would not be scored as "positive affect" for the mother, unless it were accompanied by other behavioral criteria of positive affect.

b. Mixed questionable - Tone is more important than content. Words spoken in a hostile, sarcastic, or mocking tone, in response to a child's distress, are scored "mixed questionable".

VI. Miscellaneous

Off camera

If one person is on camera and the other is off, try to score the vocal domain on what can be heard on the tape.

It is harder to go ahead and score physical, though it should be tried. (Physical interaction is less likely to occur if one person is off-camera.)

For affect exchanges, score the person who is on camera; if the person off camera is crying, for example, his/her affect can be scored as well.

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