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Infant Temperament and Maternal Responsiveness as Predictors of Attachment at 1 Year

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INFANT TEMPERAMENT AND MATERNAL RESPONSIVENESS AS

PREDICTORS OF ATTACHMENT AT 1 YEAR

by

Belinda E. Sims

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VITA

The author, Belinda Enita Sims, is the daughter of Bennie Thomas Sims and Barbara (Wilkins) Sims. She was born on August 5, 1963, in Detroit, Michigan.

Her elementary education was obtained in the public schools of Detroit, Michigan. Her secondary education was completed in 1981 at the Dominican High School, Detroit, Michigan.

In September, 1981, Ms. Sims entered Wayne State University, where she received the degree, Bachelor of Arts, with honors in psychology in May, 1986. During the academic years of 1984 to 1986, Ms. Sims was a Minority Access to Research Careers (MARC) fellow.

In August, 1986, Ms. Sims received a fellowship from the Illinois Minority Graduate Incentive Program (IMGIP), using it to study at Loyola University at Chicago, in Developmental Psychology.

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CHAPTER I

INTRODUCTION AND REVIEW OF THE LITERATURE

In trying to understand the formation of infant-
mother attachment, researchers have found it necessary
to assess the variables that influence attachment. Two
variables that have been hypothesized to influence
attachment are infant temperament, and maternal
responsiveness. However, in studying the influence of
these variables on attachment, most researchers, treating
them independently, have found an inconsistent
relationship among temperament and maternal
responsiveness, and infant-mother attachment. One reason
for these inconsistent findings is that these studies
have ignored the potential interaction effects that
temperament and maternal responsiveness may have on
attachment. The purpose of this study was to assess the
predictiveness of both maternal responsiveness and infant
temperament on later attachment.

Attachment

The unique relationship that forms between an infant

1

and his/her mother (caregiver) has been studied for decades. During the past four or five decades, this relationship has been examined within an evolutionary-biological perspective, in an effort to understand the determinants, antecedents, and enduring aspects of the relationship. This relationship is most commonly referred to as infant-mother attachment.

Attachment has been defined as an affective tie between mother and infant, developing in the first year of life, and affecting later social development and competence. The concept of attachment in this sense is associated with John Bowlby's (1969) evolutionary-biological perspective, and has been expanded by other researchers (e.g. Ainsworth & Wittig, 1969). The affective tie has been postulated by Bowlby (1969) to be influenced in part by the infant's natural propensity to seek proximity with the mother, displaying behaviors at birth and after, which promote proximity. Through this display of proximity behaviors the infant is ensuring his/her survival, and ultimately the survival of the species. Some of the proximity behaviors that are displayed are crying, vocalizing, smiling, gazing, clinging, reaching, and approaching.

Basing his theory largely on the observations of subhuman primates, Bowlby postulated about the development of attachment behaviors in humans. Once

present, the aforementioned behaviors can be used to bring the mother into proximity with the infant during times of fear, separation, or fear of impending separation, from the mother (Bowlby, 1969). Once the infant is able to locomote he/she is able to actively seek and follow the mother to promote proximity. In addition, proximity maintaining behaviors are present at reunion (reaching, clinging, smiling) to keep the mother and infant together so that the infant can be calmed or show delight at the mother's return (Ainsworth & Stayton, cited in Bowlby, 1969).

But the fact that these attachment behaviors are present does not constitute the attachment relationship. It is not until the infant is able to recognize the mother, and based on this recognition, use the behaviors in ways to promote proximity, that the formation of attachment is thought to take place. This does not usually occur earlier than four months of age (Bowlby, 1969). These behaviors are likely to be seen when the mother leaves the infant. For example, the infant who protests the mother's leaving is seen as using separation protest to return the mother to proximity.

Yet proximity seeking is not only initiated during a heightened state in the infant. Using a control systems approach, Bowlby (1969) postulated that the proximity seeking by the infant is under continuous monitoring of

need for proximity contingent with the situation and the position of the attachment figure. If the infant experiences wariness, proximity behaviors would be increased to bring the mother into closer contact. If the infant's situation is not threatening, proximity behaviors would be decreased, allowing the infant to explore the environment or play (Bowlby, 1969).

However, during these nonthreatening situations, the infant's feeling of security is not diminished (Sroufe & Waters, 1977). Bowlby refers to the infant's "set goal" or need for proximity as varying depending on endogenous or exogenous factors. Endogenous factors can be internal states such as fatigue or illness. Exogenous factors can be feelings of danger due to the environmental setting or the appearance of unfamiliar people. The infant's "set goal" is altered depending on the changes in endogenous and exogenous factors as they relate to the proximity of the mother. Hence, given the same exogenous factors, if a stranger is present the infant may feel the need to be closer to the mother during this wariness period. In this way the formation of attachment between the infant and mother is interactional, based on the infant's proximity behaviors and the mother's response to these behaviors. Moreover, before about six months (when locomotion is not present) the mother is the more active force in proximity maintenance, since she must respond to

the infant's cues. After the infant becomes mobile
he/she takes on a more active role, leading to a more
visible sign of infant-mother attachment.

To summarize the development of Bowlby's (1969)
theory of attachment, four phases were put forth to
encompass the main premises:

*In the first phase the infant does not discriminate
between individuals, orienting to them with ease
through visual tracking, grasping, reaching,
smiling, and babbling. At about twelve weeks the
intensity of the behaviors increase, becoming more
social in nature.

*In phase two, the infant displays the same social
behaviors; but now he/she begins to discriminate
between individuals, becoming more oriented towards
the mother.

*During phase three (beginning between 6 and 7
months), the infant becomes more discriminating in
the way he/she treats others, choosing to maintain
proximity to the mother and selecting a few others
to whom to make secondary attachments. Strangers
and unfamiliar settings becomes distressful to the
infant and are treated with caution. It is during
this phase that the attachment is evident and
visible. This phase usually lasts throughout the
second year.

*In phase four, the young child begins to gain
insight into the mother's "set goals", realizing
her feelings and motives. This new relationship
leads to the formation of a partnership.

Even though the attachment behaviors diminish after
about the second year, the relationship endures becoming
more sophisticated. This is facilitated through
cognitive maturation. Bowlby (1969) purports that the
infant makes inferences based on the mother's set goals,
becoming more flexible in his/her behaviors, developing a
sophistication in views of the working of his/her world.
Hence, while the behaviors dissipate, the attachment bond
remains.

Given this perspective of the development of
attachment, Bowlby (1969) suggested that the way to
assess whether or not an attachment is formed is to
assess the infant's reaction to separations; because it
is through separation that the attachment behaviors most
likely will be exhibited. Also, Bowlby suggested
additional observations of the dyad that should be made
in an attempt to assess the attachment relationship.
These observations are: "infant behaviors that initiate
interactions, infant responses to interaction initiated
by the mother, behavior aimed to avoid separation,
exploratory behavior, and how it relates to the position
of the mother, and withdrawal behavior, and how it

relates to the position of the mother (p.334)." These conditions should be viewed in different situations such as: "in relation to mother's whereabouts and movements (mother present, mother departing, mother absent, mother returning), in the presence of others (familiar persons, present or absent, and strangers, present or absent), in nonhuman situations (familiar and unfamiliar), and in varying conditions of the child (healthy, sick, or in pain; fresh and fatigued, hungry or fed) (p.335)."

Building on Bowlby's theory, Ainsworth devised a method to structure the assessment of the infant-mother attachment. The Strange Situation (Ainsworth & Wittig, 1969) is a series of mildly stressful 3 minute episodes combining both separation of the infant from the mother and reunion of the infant with the mother within the context of an interaction with a stranger. However, more than just attachment behaviors is the focus of this paradigm. A major aspect of this paradigm is an assessment of the quality of the attachment relationship (Ainsworth, Blehar, Waters, Wall, 1978).

In this paradigm, little emphasis is placed on examining the antecedent behaviors of attachment (crying, sucking, grasping, etc.), behaviors thought to be already in place. Instead, emphasis is given to examining the infant's reactions to the attachment figure and assessing the quality of the attachment, based on how the

attachment is exhibited (Lamb, Thompson, Gardner, &
Chardov, 1985). The ideal attachment is manifest when
the infant is able to use the mother as a secure base
from which to explore the environment (Ainsworth et al.,
1978).

While emphasis is given to the infant's behavior
during the Strange Situation, it is important to keep in
mind the role that Ainsworth et al. (1978) saw the mother
playing in the formation of attachment. True, the
strange situation displays many infant behaviors, but
maternal responsiveness to the infant and his/her
behaviors also is an important determinant of the
attachment. Mothers who are appropriately responsive to
the infant's behaviors have been shown to have infants
who are securely attached, while mothers who are not,
have infants that are insecurely attached (Ainsworth et
al., 1978). Thus, it is postulated that the mother who
responds appropriately, in a manner contingent to the
infant's behaviors, can become a secure base from which
the infant can explore the environment (Ainsworth et al.,
1978). For example, a mother who is there for her infant
when he/she is in a wary state and is responsive to
his/her display of attachment behaviors (e.g. proximity
seeking, contact maintaining, etc.), can give the infant
a feeling of security, allowing him/her to calm down and
explore the environment.

In the strange situation, support for the secure base phenomenon has been evidenced by the activation of exploration in the situation room with the mother, and diminished activation during the stranger's presence and during separation (Ainsworth et al., 1978). The infant who uses the mother as a secure base often checks-in with the mother during exploration behaviors, seeking proximity in states of wariness or fear. This infant is also usually classified as securely attached (Ainsworth et al., 1978). This translates into the infant having a responsive relationship with the mother, and the mother responding contingently to the infant's needs.

Indeed, Ainsworth et al.'s (1978) conception of the attachment paradigm is commensurate with Bowlby's (1969) postulations about the ways in which the attachment relationship should be examined. As outlined above, the Strange Situation observes attachment in the context of a strange person, a strange environment, and in the context of behaviors towards the mother in this situations.

Based on the Strange Situation, three types of classifications were postulated, forming two patterns of attachment, secure and insecure, with the insecure pattern further subdivided into two classifications, avoidant and anxious/resistant. These classifications were further labeled: insecure avoidant (A), secure (B), and anxious/resistant (C). An avoidant infant shows

conspicuous avoidance of proximity to or interaction with the mother, little or no tendency to seek proximity or cling, and is either not distressed during separation, or the stress is due to being alone, not because the mother is absent (Ainsworth et al., 1978). A secure infant displays proximity to and contact maintenance with the mother. This infant responds to mother on her return with smiling, crying, or approach, and may or may not be distressed during separation, but if so, the distress is due to mother's absence (Ainsworth et al., 1978). An anxious/resistant infant displays both interaction and resistance (ambivalent) behavior to the mother, little or no tendency to ignore his/her mother in the reunion, and even shows anger toward the mother (Ainsworth et al., 1978).

Within each major classification there are subclassifications to further describe the attachment. There are two subclassifications within the A group, four subclassifications in the B group, and two subclassifications within the C group. Each subclassification serves as a finer description of the attachment, since all infants do not display all of the global behaviors captured in the overall secure, insecure categories. Descriptions of the subclassifications are provided in Appendix A.

The Strange Situation is now viewed as the

standard way to measure the security of attachment as
proposed by Bowlby (1969) and Ainsworth et al. (1978)
(Sroufe & Waters, 1982). Much research has used this
paradigm to assess possible predictors of individual
differences in the attachment classifications. Two areas
thought to influence individual differences in
attachment, temperament and maternal responsiveness, have
received considerable attention. However, the
inconsistent results of these studies have sparked more
controversy than clarity (Ainsworth et al., 1978;
Goldsmith & Alansky, 1988; Lamb et al., 1985).

<div align="center">

Temperament
</div>

Much of the controversy in the infant temperament
literature surrounds the issue of whether or not
temperament can account for the variation observed in
overall attachment classification, (e.g. Goldsmith,
Bradshaw, & Rieser-Danner, 1986), or for behaviors
displayed in the Strange Situation (e.g. Goldsmith et
al., 1986; Weber, Levitt, & Clark, 1984). The construct
of temperament is viewed as stylistic qualities of
personality (Thomas and Chess, 1977), genetically based
(Buss and Plomin, 1987), providing a basic process of
reactivity and self regulation (Rothbart, 1981).

Thomas and Chess (1977) view temperament as early-
appearing, constitutionally-based behavioral tendencies
that can be operationally defined by nine dimensions:

approach/withdrawal, adaptation, mood, intensity, rhythmicity, distractibility, activity, and threshold (Thomas and Chess, 1977). From these dimensions infants can be categorized into easy, slow-to-warm-up, and difficult temperamental categories.

Buss and Plomin (cited in Bates, 1987) view temperament as being more than constitutional, they agree that it is genetically based, and thus less malleable to environmental and biological influences. In this view, three inherited traits define temperament: emotionality (arousal in response to events), activity (tempo and energy expenditure), and sociability (level of preference for rewards of being with other people).

Yet another perspective (Rothbart, 1981) views the basic processes of temperament as reactivity and self-regulation. Reactivity involves several response systems: brain activation processes, autonomic nervous system properties, and endocrine processes. Self regulation involves attention, motion approach versus avoidance, self-stimulation or self-soothing, and social communication. The reactive processes interact with the self-regulation system to modulate expressions of reactivity. This interaction process also allows for individual differences in temperament.

Given these different definitions of temperament, it is not surprising that different measures were devised to

test each construct. Carey (1978) developed a number of parent report questionnaires to assess infant temperament based on the nine dimensions posited by Thomas and Chess (1977). These measures ask the parent (usually the mother) to rate, on a numeric scale, the presence of various behaviors in their infants and children. These behaviors are designed such that when scored, they yield scores on each dimension.

Rothbart (1981) also devised a parent report form based on the basic processes of reactivity and self-regulation in infancy. The Infant Behavior Questionnaire (IBQ) consists of questions concerning the occurrence of specific infant behaviors during the previous week. There are six scales derived from the measure as well as an overall positive/negative affect score. The scales are activity, smiling and laughter, distress to sudden or novel stimuli, distress to limitations, soothability, and duration of orienting.

In addition, the Neonatal Behavioral Assessment Scale (NBAS) (Brazelton, 1973) has been used as an early indication of temperament. Specifically, the amount of fussiness, crying, and orienting has been interpreted in this way. From these measures, the impact of temperament on various infant behaviors has been examined, one being infant-mother attachment.

Researchers and theorists who have postulated a

relation among temperament and attachment have done so along many lines. Goldsmith, Bradshaw, and Rieser-Danner (1986) suggest that temperament dimensions can be understood as mediators of the social interactional processes underlying the formation and maintenance of the attachment bond. It is also suggested that temperament dimensions may make relatively direct contributions to individual differences in specific, observable, attachment behaviors and to key organizing influences in attachment theory, such as susceptibility of fear (Goldsmith et al., 1986). Other postulations have been that caregiver responsiveness may influence both the development of attachment, and the expression of temperament (Goldsmith & Campos, 1982), and that infant temperament may lead to caregiver nonresponsiveness (Egeland, & Sroufe, 1981), a point to be explored in the present study.

In spite of their theoretical appeal, the research generated by these various views has demonstrated inconsistent results. Some of the inconsistency may be due to the many ways temperament can be assessed. In a study of attachment, temperament and social referencing, Bradshaw, Goldsmith, and Campos (1986) found that expression of temperament in an overall positive/negative affect score did not correlate to overall strange situation behaviors, but it did correlate with avoidance

behavior. That is, temperament and avoidance of mother or stranger were related. Yet, in a study to assess the relation between temperament and attachment classification, Bates, Maslin, and Frankel (1985) found that a measure of six month temperamental difficulty was not associated with classification. While in a study of the role of maternal and infant temperament, Weber, Levitt, and Clark (1984), found that infant temperament did not predict infant attachment classification, but that maternal temperament did.

This last finding is important because it not only provides evidence for the argument that attachment and infant temperament are not related but suggests that maternal temperament may be a significant predictor of attachment classification. Mothers who rated themselves as more adaptive, had infants who were classified as secure (B1,B2). Mothers who rated themselves as more reactive (intense, inappropriate behaviors) had infants who were classified as type A (avoidant). Finally, mothers who rated themselves as less adaptable to new situations had infants who were classified as type B3 and C (ambivalent). However, the results are complex, as infant temperament did predict behaviors toward the stranger. From these findings the authors concluded that individual differences in the infant's strange situation behaviors are related to maternal and infant temperament,

but that maternal temperament is linked specifically to
attachment classification.

In a more controversial speculation of the
relationship between temperament and attachment, Chess
and Thomas (1982) posited a temperamental link to
attachment. Specifically, a subset of the nine
temperament dimensions (i.e. approach/withdrawal,
adaptability, quality of mood, and intensity) were
proposed to be related to the infant's behavior in the
Strange Situation. However, these relationships remain
untested, and in a reply to the Chess and Thomas
assertion, Sroufe and Waters, (1982) disagreed with the
statement that individual differences in Strange
Situation Behaviors could be reduced to variations in
temperament.

In support of their counter argument, Sroufe and
Waters (1982) contended that: "1) the literature does
not show that attachment classifications are a measure of
temperament but [it does show] that they are measures of
a relationship; 2) that individual differences arise due
to the quality of caregiver interaction; and 3) that
individual differences based on caregiver interactions
are predictive through the early childhood years
(p.745)." Sroufe (1984), went on to argue that to
suggest a direct relationship between infant temperament
and attachment is to abandon the significance of the

strange situation paradigm. Since the paradigm is designed to tap into a relational construct between the infant and caregiver, to reduce it to individual infant temperamental variation is abandoning the purpose.

However, the fact that attachment and its paradigm are based on a relational construct should not preclude a contribution of temperament to the process. Moreover, since Chess and Thomas' (1982) argument has not been tested we should not overrule its potential value. It is possible that infant temperament, as well as maternal temperament, will affect the mother's ability to respond in a sensitive manner to the infant, in this way affecting the infant-mother attachment. This would be consistent with Ainsworth et al.'s (1978) discussion of the mother's ability to respond sensitively to her infant, although it was not examined in the original work. Therefore results like those found by Weber et al. (1984) suggesting that maternal temperament predicts attachment classification may be the avenue along which temperament and attachment travel. Although the Weber et al. study does not come to this conclusion, it has been suggested in theory that infant temperament may affect maternal responsiveness (Goldsmith and Campos, 1982; Milliones, 1978).

To further expand on this idea within a transactional model (Sameroff & Chandler, 1975) suggests

that attachment classifications may be determined by what
the mother brings to the situation and what the infant
brings. In this view then, the transaction takes place
through an interaction of the behaviors the infant
displays and the mother's ability to be responsive to
them. The infant's behavior is influenced by his/her own
temperamental qualities while the mother's responsiveness
is influenced by her own temperamental qualities. This
latter point is not to suggest, however, that there
should be a "match or mismatch" (Sroufe, 1984) in
temperament between the mother and infant. A
temperamental match would occur when both mother and
infant have congruent temperamental styles (Sroufe,
1984). A temperamental mismatch would occur when mother
and infant have incongruent temperamental styles (Sroufe,
1984). Instead, the quality of the interaction may
depend on the mother's ability to be responsive, over and
above her temperamental tendencies.

However, this approach does not negate the
likelihood that the infant's temperament would affect the
mother's responsiveness. In a study by Milliones (1978)
investigating the relationship between perceived child
temperament and maternal behaviors, maternal
responsiveness was related to infant difficulty. Almost
30% of the variance in maternal responsiveness was
accounted for by infant temperament. Thus, it appears

that this study as well as those that have found
relationships between infant strange situation behaviors
and temperament (Bradshaw et al., 1987; Miyake, Satoh,
and Takahashi, 1983; and Weber et al., 1984), and
maternal temperament and attachment (Weber et al., 1984)
may have been examining components of a transactional
approach to attachment. The result of an interaction
between infant behaviors and maternal responsiveness
could be a major contributor to the security of the
attachment.

This transactional approach, where contributions by
both infant and mother are examined concurrently will
accomplish two things: (1) it will allow a place for
temperament in the attachment paradigm, but (2) it does
not go against the premise that maternal factors,
especially maternal responsiveness to the infant is an
influential determinant of classification. Thus, using a
transactional model of temperament and attachment,
provides a structure within which to investigate
temperament as one, but not the only, behavioral system
that influences attachment.

Maternal Responsiveness

The mother's ability to respond in a sensitive
manner to her infant's needs is considered another key
influence of infant-mother attachment. As mentioned in
the earlier review of attachment, Ainsworth et al. (1978)

postulated that differences in maternal responsiveness could influence differences in attachment classifications. In an assessment of infant-mother attachment (Ainsworth et al., 1978), maternal responsiveness was measured by home observations of a number of maternal behaviors, each rated on a nine point scale. From these ratings it was found that different maternal behaviors in different situations were able to discriminate insecure versus secure classifications.

However, what was common about the behaviors was that sensitive responses were associated more with secure classifications than insensitive responses (Ainsworth, et al., 1978). Thus mothers of secure infants were more responsive to their infant's crying, acknowledged their babies more when entering a room, and held their babies more affectionately, and tenderly (Ainsworth et al., 1978). Overall, these mothers were found to be more sensitive, more accepting, more cooperative, and more accessible (Ainsworth et al., 1978). Thus it was concluded that, maternal sensitivity was associated with secure attachment classifications.

Using a Q-sort of maternal sensitivity, Pedersen, Moran, Sitko, Campbell, Ghesquire, and Acton (1989) were able to distinguish between securely and insecurely attached infants. Like Ainsworth et al. (1978), Pedersen et al. (1989) found that in contrast to mothers of

insecurely attached infants, mothers of securely attached infants were sensitive in their responses to the infants' behaviors. The secure mothers "noticed their babies' signals, effectively used these signals to guide their behaviors, knew a lot about their infants, and appeared to enjoy being with them in that they cuddled and spoke positively about them (Pedersen et al., 1989, p.14)." These mothers also found their infants to be less stressful (Pedersen et al., 1989).

Likewise, Blehar, Lieberman, and Ainsworth (1977) found that mothers who displayed positive infant responses such as playfulness and contingent pacing of interaction in the early months, had infants who were more secure at the end of the first year. Those infants who experienced brief, impassive, face to face interactions with the mother in early months were later judged to be insecurely attached (Blehar et al., 1977).

The just mentioned studies of the relationship between maternal responsiveness and attachment lend support to the influence of maternal behaviors on attachment. However, this relationship has not been found on a wide scale.

In a recent meta-analysis of predictors of attachment, Goldsmith and Alansky (1988) reviewed studies investigating the influence of maternal factors on attachment. This analysis showed a small effect of

maternal responsiveness on attachment. Influences of infant temperamental factors on attachment also were examined. Again, only a small predictive effect of temperament on one facet of insecure attachment behavior was found. This lack of strongly significant results may be due to the differences in methodologies used to assess these variables.

Beyond the difficulties arising from the myriad of measures used to assess the variables in question, these inconsistent findings on the relationship of infant temperament and maternal responsiveness to later attachment may have resulted from these factors being investigated independently, ignoring any possible interactions that may exist. Perhaps the relationship between these variables, and their effect on attachment may be demonstrated in a transactional model. In this model, the effects of temperament and maternal responsiveness on later attachment receives concurrent consideration. Given that the relationships have, for the most part, been investigated independently, the purpose of this study was to investigate the relationship of both on later attachment within a transactional model.

Infant Risk Factors

A further test of this transactional approach is provided by investigating the effects of temperament and maternal responsiveness on later attachment across

perinatal risk groups. The transactional model (Sameroff & Chandler, 1975) also recognizes the possibility that variation within a person may affect different aspects of that person as well as the dynamic qualities of interactions. The influence of infant risk factors (e.g. prematurity) on temperament and the mother's ability to be responsive to her infant may influence the quality of the infant-mother interaction, with significant effects on the attachment relationship.

The influence of perinatal risk (e.g. infant prematurity) on temperament has been examined. It has been found that on measures of temperament, preterm infants do not differ significantly from fullterm and healthy infants (Oberklaid, Prior, Nolan, Smith, Flavell, 1985). Yet, other studies have found that premature infants are perceived by their parents as more difficult (Field, Hallock, Ting, et al., 1978; Goldberg, 1978).

Socioeconomic status has been posited as a possible mediator of the effects of prematurity on the caregivers' perceptions of infant temperament (Oberklaid, et al., 1985). Low-risk mothers, as defined by educational level or monetary resources, may be better able to manage their premature infants, subsequently rating them more positively. Within a transactional model then, these low-risk mothers, when faced with a high-risk infant, may counteract any negative effects of their infant's

prematurity (Oberklaid, et al., 1985). This counterbalancing effect can occur because of the mothers' heightened sensitivity to the needs of their infants; a sensitivity perhaps made possible by the mothers knowledge, resources, and available support.

In their early work, Ainsworth et al. (1978) examined how premature status effected the formation of attachment classification. It was found that the distribution of infants into the three attachment groups was not different for premature infants and full-term infants. Based on these results, it was suggested that attachment formation is the same for both groups, a conclusion supported by other research. Holmes, Ruble, Kowalski, & Lauesen, (1984), found that more of the preterm infants than the fullterm infants were classified as secure, though the difference was not statistically significant. Thus, risk factors alone are not expected to increase the amount of insecure relationships that form; yet the process by which this develops remains unknown.

Statement of Hypothesis

Although the temperament-attachment debate remains unsolved, it should not be abandoned. Results from the meta analysis (Goldsmith et al., 1988) suggests that neither temperament nor maternal responsiveness is a strong predictor of attachment. However, these

investigations were based on independent assessments of temperament and maternal responsiveness, which do not take into account, the potential of possible interaction effects. The contribution of maternal responsiveness in conjunction with infant temperament should be considered to understand differences in attachment classifications.

Moreover, viewing this question within a transactional model requires consideration of what each person in the dyad brings to the relationship. In this type of analysis, the relative contributions of each member is taken into account. If the process is in fact best characterized as a transaction, then the contribution of temperament and maternal responsiveness to attachment may itself be sensitive to factors impacting on the dyad. For example, if the infant experiences perinatal risk, a factor thought to be influential to the transactional process, then the interrelationship of temperament and maternal responsiveness to attachment may follow different patterns.

Based on the clues suggested in the attachment, temperament, and maternal responsiveness literature, this study will examine the influence of both temperament and maternal responsiveness on attachment. The influence of perinatal risk on the predictiveness of these variables also will be examined. It is hypothesized that both

constructs taken together will predict attachment classification at 12 months. It is also hypothesized that infant risk will influence how temperament and maternal responsiveness predict attachment classification.

CHAPTER II

METHOD

Subjects

The 42 mother-infant dyads examined in this study
are part of an ongoing longitudinal study (currently in
its ninth year) of infant and child development (social,
emotional, developmental, and cognitive). All
participants who vary in perinatal risk, are from middle
class, intact families. High perinatal risk (n=25) in
this sample is defined as infants born: (a) premature at
birth (i.e. less than 37 weeks gestational age); or (b)
fullterm with illness requiring intensive care. Low
perinatal risk (n=17) is defined as: (a) being the
healthy fullterm infant of a sick mother; or (b) being a
healthy fullterm infant with no maternal complications.
Table 1 provides a list of perinatal and maternal
characteristics of the sample.

The assessments for this investigation were gathered
at 2,4,6, and 12 months of age, with assessments at
corrected ages for the premature infants. All dyads with
complete data at each age to be examined were chosen for

Table 1
Demographic Characteristics of Infants and Mothers

Maternal Characteristics

Maternal Age at
Infant's Birth

Total		High Risk		Low Risk	
M	sd	M	sd	M	sd
28.95	2.97	29.41	3.33	28.33	2.35

Years of Education

Total		High Risk		Low Risk	
M	sd	M	sd	M	sd
16.27	1.78	16.29	1.83	16.22	1.73

Perinatal Characteristics

	Total		High-Risk		Low-Risk	
	M	sd	M	sd	M	sd
Birth Weight	2974 g	829	2606 g	848	3516 g	397
Gestational Age	37.82	3.66	36.14	3.89	40.31	.74
Days in Hospital	14.00	15.71	20.07	17.96	5.05	2.32
Obstetric Complications Score	100.36	24.75	92.71	18.41	111.63	28.85
Postnatal Complications Score	112.70	40.32	82.61	18.35	157.05	12.84

this study. The exception to this was the maternal
responsiveness data, where assessments at either 2, 4, or
6 months of age were utilized to maximize the sample
size. Thus average scores for assessments made at these
ages were generated for each infant. Three infants (2
high-risk and 1 low-risk) were missing temperament data,
8 infants (5 high-risk and 3 low-risk) were missing
maternal responsiveness data, and 8 infants (4 high-risk
and 4 low-risk) were missing attachment data, with a
total of 13 cases missing one or more data points.
Thus, the 42 infant-mother dyads (differing in perinatal
risk) for this study represent 76% of the total sample
size of 55, involved in the aforementioned longitudinal
study.

Assessment of Temperament

Infant temperament was assessed at 2,4, and 6 months
of age using the Carey Infant Temperament Questionnaire
(cited in Thomas and Chess, 1977). This measure assesses
temperament based on the nine dimensions of temperament
posited by Thomas and Chess (1977). The measure requires
that the parent, (in this study, the mother) rate the
presence of various behaviors in her infant on a numeric
scale from 1 to 3. To do this, questionnaires were given
to participants at each follow-up visit (2,4, and 6
months), and returned by mail after completion. Using
standard scoring procedures (Carey, 1977), items were

scored and means were generated for each infant long each dimension at each age:

*activity level (inactive...very active)

*rhythmicity (rhythmic...arrhythmic)

*approach/withdrawal (approaches easily...withdraws avoidantly)

*adaptability (adapts easily...slow to adapt)

*intensity (mild...intense)

*mood (pleasant-happy...negative-irritable)

*persistence (persistent...non-persistent)

*distractibility (ignores distraction...easily distracted)

*threshold (indifferent...very sensitive).

From these dimensions, using standard scoring procedures, infants can be classified into easy, difficult, and slow to warm up categories (Thomas & Chess, 1977). However, because of the greater sensitivity of the dimensions to the components of temperament, they were of more interest than the temperament categories to the questions being asked. Therefore, the nine dimension scores were used in the data analyses.

Assessment of Maternal Responsiveness

Maternal responsiveness was measured through face to face mother-infant interaction sequences at 2,4, and 6 months of age (Lauesen, Reich, Holmes, and Gyurke, 1984).

Each mother-infant dyad was videotaped in a 6-minute
structured interaction sequence that was divided into 11
different events. The interaction sequence required that
the mother engage in specific types of interactions with
the infant for a specified time. The specific typed
instructions were presented to the mother through an
earphone.

The interaction task began and ended with the mother
engaged in peripheral involvement with the infant. The
first sequence began with the mother looking at the
infant in an emotionless expression (impassive face),
then increasing interactions to the point that she could
elicit a given response from the infant, and then
decreasing interaction again until finally, she left the
room. Only the active episodes, (i.e. 3-8), were used
for this study. These were: 3) mother smiles and talks
to the infant; 4) mother tries to get the infant's
attention; 5) mother tries to imitate the infant's facial
expression; 6) mother imitates the infant; 7) mother
tries to get the infant to follow a red ball; 8) mother
tries to get the infant to grab a toy.

The interaction sequences were recorded in
continuous real time. Behavior categories for the mother
included eyes, reach, face, and voice variables. The
behaviors were coded in 4-second time intervals. That
is, after every 4 seconds, the appropriate code was

assigned to each behavior category in that time interval. The eyes, reach, and face variables were divided into looking toward (coded +1) or looking away (coded +2), reaching toward (coded +1) or no reaching (coded +2), and smiling (coded +1) or not smiling (coded +2) respectively. The voice variable was divided into positive (coded +1), none (coded +2), and negative (coded +3). The resulting maternal responsiveness score denotes the sum of the scores given to the behaviors in each epoch, summed across all interaction sequences utilized in this study. These scores are interpreted as a measure of the amount of positivity that the mother displayed while engaged in the interactive episodes. Lower scores denote more positive interactions.

<u>Assessment of Attachment</u>

Attachment was assessed at 12 months using Ainsworth and Wittig's (1969) Strange Situation. In this videotaped paradigm, the infant was subjected to increasingly stressful situations that involved two separations from, and two reunions with the mother. The following 3 minute episodes took place:

Episode 1 - Mother and baby alone in play room.
Baby playing.

Episode 2 - Stranger enters the room and sits next to mother. After 1 minute the stranger engages in a 1 minute

conversation with the mother. Next, the stranger engages in play with the infant. The mother leaves unobtrusively.

Episode 3 - First separation. The stranger and baby are alone in the room.

Episode 4 - First reunion. Mother enters the room and the stranger leaves.

Episode 5 - Second separation. The mother leaves the baby alone in the room. This episode is curtailed if too stressful for the baby.

Episode 6 - The stranger re-enters the room providing comfort to the baby if necessary.

Episode 7 - Second reunion. The mother re-enters the room and the stranger leaves.

The standard dimensions examined to determine attachment classifications were: avoidance, resistance, proximity seeking, and contact maintaining (Ainsworth, Blehar, Waters, and Wall, 1978).

These tapes were scored by two observers using standard scoring procedures of the above dimensions. The subsequent overall classifications that could be made from these dimensions were insecure, avoidant (A), secure (B), and insecure, anxious/avoidant (C) (Ainsworth et

al., 1978). An avoidant infant showed conspicuous avoidance of proximity to, or interaction with, the mother; little or no tendency to seek proximity or cling; and was either not distressed during separation, or the stress was due to being alone, not because the mother was absent (Ainsworth et al., 1978). A secure infant displayed proximity to and contact maintenance with the mother, responded to mother on her return with smiling, crying, or approach, and may or may not have been distressed during separation, but if so, the distress was due to mother's absence (Ainsworth et al., 1978). An anxious/avoidant infant displayed both interaction and resistance (ambivalent) behavior toward the mother, little or no tendency to ignore the mother in the reunion, and even showed anger toward the mother (Ainsworth et al., 1978).

Procedure

The assessment of temperament via the Carey Temperament Questionnaire was made at 2, 4, and 6 months of age (with corrected ages for the premature infants). Maternal Responsiveness was also measured at these ages through the measurement of face-to-face, mother-infant interaction sequences, with an average score generated for this study. Attachment was assessed via the Strange Situation when the infants were 12 months old (corrected ages for the premature infants).

CHAPTER III

RESULTS

Multivariate Analysis of Variance tested for effects
of age at 2,4, and 6 months among the attachment groups
on the temperament dimensions. No group differences were
found for attachment across age, multivariate $F (36,
50)=.74$, $p=.82$. Thus, the temperament dimensions were
averaged across age (2,4, and 6 months) producing, for
each dyad, nine temperament scores. Average positivity
scores for the maternal responsiveness measure were
calculated across each age for which a score was
obtained, producing, for each dyad one positivity score.
In essence, the positivity score is a created variable,
based on an individual's score at each age.

Table 2 displays the mean temperament scores and
standard deviations for each attachment group when
averaged across age. Table 3 displays the average
positivity scores (measure of maternal responsiveness)
obtained for the mothers in the face-to-face interactions
for each attachment group. Coding of the Strange
situation resulted in 8 infants being classified as

Table 2

Mean Temperament Rating by Attachment Group

	Group A	sd	Group B	sd	Group C	sd
Mood	2.521	1.10	2.475	2.10	2.402	1.79
Distractibility	2.325	2.52	2.443	2.18	2.404	1.21
Persistence	2.297	1.58	2.199	2.96	2.137	3.63
Activity	2.352	3.49	2.471	1.89	2.395	1.60
Rhythmicity	2.268	3.44	2.330	3.56	2.422	3.49
Adaptability	2.571	2.21	2.632	2.04	2.524	2.97
Approach/With	2.502	2.48	2.437	2.47	2.443	2.18
Threshold	2.056	3.11	1.955	3.44	1.918	3.02
Intensity	1.789	1.89	1.928	2.09	1.911	0.58

Table 3

Average Maternal Responsiveness Score by Group

Group A	sd	Group B	sd	Group C	sd
108	0.23	95	0.21	101	0.11

Note. The lower the score, the more positive the interaction.

insecure avoidant (A), 26 being classified as secure (B),
and 8 being classified as anxious/avoidant (C) (see Table
4).

Canonical discriminant analyses were used to
investigate the impact of both temperament and maternal
responsiveness on attachment classification. Discriminant
analysis classifies cases to mutually exclusive groups
based on a set of predictor variables. In this way, the
predictor variables important for distinguishing between
groups can be determined, and a measure of their accuracy
obtained.

For these analyses, both direct and stepwise
discriminant analyses were used. Direct discriminant
analysis forces all variables into the analysis for
consideration. Stepwise discriminant analysis enters and
removes variables into and out of the analysis
respectively, based on a tolerance criteria. In this case,
the stepwise analysis based on minimizing the overall
Wilks' lambda was employed.

The direct method was used in order to test the
effects of all variables concurrently on attachment
classification. A stepwise discriminant analysis was then
employed to examine the relative contribution of these
variables by looking at which variables contributed the
most information to the attachment classification. In
addition, a direct discriminant analysis was used to test

Table 4

Number of Cases in each Attachment Classification

Insecure Avoidant (A)	Secure (B)	Insecure Resistant (C)
n=8	n=26	n=8

the effects of a subset of temperament dimensions:
approach/withdrawal, adaptability, mood, and intensity on
attachment classification. These temperament dimensions
were posited by Chess and Thomas (1982) as possibly
having a stronger influence on attachment than the
complete set of nine dimensions.

Finally, a stepwise discriminant analysis was
employed to examine which variables predicted attachment
classification for high-risk infants and low-risk
infants. Infant risk was employed to assess how
temperament and maternal responsiveness may effect
attachment in heterogeneous groups. An explanation of
the format in which the results are presented is provided
in Appendix A.

Total Sample with all Variables

The first analysis was a direct discriminant
analysis using temperament and maternal responsiveness as
the predictor variables for the three attachment groups.
This analysis produced nonsignificant discriminant
functions (see Table 5) with only 69% of the infants
being correctly classified into the A, B, or C groups
(see Table 6).

Next, a stepwise discriminant analysis assessed
which variables from the direct analysis, if any,
contributed to the attachment classifications. The
intensity and persistence dimensions of temperament

Table 5

Canonical Discriminant Functions for Direct Discriminant Analysis
with 3 Groups For the Total Sample

Function	Eigenvalue	Percent of Variance	Cumulative Percent	Canonical Correlation
1	0.43550	79.83	79.83	0.5507
2	0.11005	20.17	100.00	0.3148

After Function	Wilks' Lambda	Chi Squares	Degrees of Freedom	Significance
0	0.6275	16.074	20	0.7120
1	0.9008	3.601	9	0.9356

Table 6

Classification Results and Predicted Group Membership For
the Total Sample

Actual Group	Cases	A	B	C
Insecure A	8	5 62.5%	3 37.5%	0 0.0%
Secure B	26	1 3.8%	25 96.2%	0 0.0%
Insecure C	8	1 12.5%	6 75.0%	1 12.5%

Percent correct classifications: 69%

passed the tolerance criteria and were entered into the analysis. However, the discriminant functions produced by these variables were nonsignificant (see Table 7). The Wilks' lambdas associated with each variable entered were also nonsignificant. Sixty-nine percent of the cases were correctly classified using the three variables entered in the analysis.

Total Sample with Chess and Thomas Variables

Since the total set of temperament dimensions did not produce significant predictors of attachment, a stepwise discriminant analysis investigated the contributions of the subset of variables suggested by Chess and Thomas (1982) (i.e. intensity, adaptability, mood, and persistence) contributed to attachment classifications. Of these four variables, three (i.e. intensity, adaptability, and mood) were entered into the analysis. But the discriminant functions produced by these variables were nonsignificant (see Table 8). The Wilks' lambdas for these variables were also nonsignificant. 68% of the cases were correctly classified using these variables.

Perinatal Risk

The following analyses were conducted to investigate the effects of perinatal risk on the contribution of infant temperament and maternal responsiveness to attachment classification. Table 9

Table 7

<u>Canonical Discriminant Functions for Stepwise Discriminant</u>
<u>Analysis with 3 Groups For the Total Sample</u>

Function	Eigenvalue	Percent of Variance	Cumulative Percent	Canonical Correlation
1	0.2038	93.93	93.93	0.4115
2	0.0131	6.07	100.00	0.1140

After Function	Wilks' Lambda	Chi Squares	Degrees of Freedom	Significance
0	0.8198	7.547	6	0.2732
1	0.9869	0.497	2	0.7798

<u>Summary of Stepwise Discriminant Analysis</u>

<u>Variable Entered</u>	<u>Wilks' Lambda</u>	<u>Significance</u>
1. Intensity	0.91943	0.1944
2. Maternal Positivity	0.86837	0.2457
3. Persistence	0.81986	0.2734

Table 8

Stepwise Discriminant Analysis for Chess and Thomas Variables with 3 Groups

Function	Eigenvalue	Percent of Variance	Cumulative Percent	Canonical Correlation
1	0.1665	80.90	80.90	0.3778
2	0.0393	19.10	100.00	0.1945

After Function	Wilks' Lambda	Chi Squares	Degrees of Freedom	Significance
0	0.8247	7.320	6	0.2922
1	0.9621	1.465	2	0.4805

Summary Stepwise Discriminant Analysis

Variable Entered	Wilks' Lambda	Significance
1. Intensity	0.9194	0.1044
2. Adaptability	0.8704	0.2542
3. Mood	0.8247	0.2925

gives the means and standard deviations for the temperament dimensions and Table 10 gives the maternal responsiveness scores for the low-risk and high-risk infants. A Multivariate Analysis of Variance (MANOVA) was employed to test the effect of infant risk and attachment classification on temperament. This analysis produced no significant main effects, but a significant interaction ($F=1.739$, $p \leq .05$) between infant risk and attachment was found. Evidence for the interaction was obtained on the persistence dimension of temperament (univariate $F=5.65$, $p<.01$).

A two way analysis of variance was employed to test the effects between attachment and risk on maternal responsiveness. Neither significant main effects nor a significant interaction was found ($F=.500$, $p=.61$). However, for exploratory purposes, the maternal responsiveness variable was employed in the further analyses.

To determine whether temperament and maternal responsiveness variables would contribute to attachment classification differently for low risk infants and high risk infants, the previously described stepwise discriminant analyses were employed for each risk group.

Low Risk Infants. For the low-risk infants, six temperament variables and the maternal responsiveness variable reached the tolerance criteria and were entered

Table 9

<u>Mean Temperament Ratings By Attachment Group for Low Risk</u>

<u>and High Risk Infants</u>

	Low Risk <u>n</u>=17			High Risk <u>n</u>=25		
	A <u>n</u>=1	B <u>n</u>=12	C <u>n</u>=4	A <u>n</u>=7	B <u>n</u>=14	C <u>n</u>=4
Mood	2.538	2.396	2.469	2.519	2.543	2.336
<u>sd</u>	n/a	1.99	1.52	1.19	2.02	2.00
Distract.	2.337	2.431	2.449	2.354	2.453	2.3
<u>sd</u>	n/a	2.45	1.44	2.72	2.01	0.88
Persistence	2.066	2.124	2.433	2.330	2.263	1.841
<u>sd</u>	n/a	3.25	1.59	1.37	2.65	2.20
Activity	2.222	2.518	2.426	2.371	2.430	2.364
<u>sd</u>	n/a	1.38	1.84	3.72	2.21	1.54
Rhythmicity	1.800	2.368	2.378	2.335	2.298	2.465
<u>sd</u>	n/a	3.25	1.79	3.11	3.89	4.97
Adaptability	2.652	2.622	2.656	2.559	2.641	2.392
<u>sd</u>	n/a	2.26	2.80	2.36	1.91	2.85
App./With.	2.766	2.456	2.545	2.464	2.421	2.341
<u>sd</u>	n/a	2.41	1.75	2.42	2.61	2.30
Threshold	2.390	2.003	1.929	2.008	1.914	1.906
<u>sd</u>	n/a	4.06	1.09	3.03	2.90	4.48
Intensity	1.611	2.002	1.918	1.814	1.864	1.905
<u>sd</u>	n/a	1.94	0.94	1.89	2.06	0.73

Table 10

Average Maternal Responsiveness Score by Attachment Group

	Low Risk			High Risk		
	Group A	Group B	Group C	Group A	Group B	Group C
	131a	99	101	104	92	101
sd	n/a	23.2	13.0	22.9	21.1	12.4

Note. The lower the score the more positive the

interaction.

a - n=1

into the analysis in the following order: intensity,
rhythmicity, persistence, mood,adaptability, maternal
responsivity, distractibility (see table 11). The
remaining variables did not reach the tolerance criteria.
Of the variables which formulated the discriminant
functions in this analysis, only one (intensity) was
found to be nonsignificant.

With no functions removed from the analysis, the two
discriminant functions were found to be significant (see
Table 11). However, the contributions of functions 1 and
2 were not found to be equal. The variables associated
with function 1 were contributing more to the group
differences. Function 1 has a canonical correlation of
.90 and accounted for 74.9 % of the between groups
variability. The contribution of these variables in the
discriminant functions resulted in 100% of the low-risk
cases being correctly classified (see Table 12).

High Risk Infants. For the high-risk infants, three
temperament variables (see Table 13) reached the
tolerance criteria and were entered into the analysis in
the following order: persistence, adaptability, and
rhythmicity. Of the variables constituting the
discriminant functions in this analysis, all were found
to be significant. With no functions removed from the
analysis, the two discriminant functions were found to be
significant (see Table 13). The contributions of

Table 11

Canonical Discriminant Functions for Stepwise Discriminant

Analysis with 3 Groups for Low Risk Infants

Function	Eigenvalue	Percent of Variance	Cumulative Percent	Canonical Correlation
1	4.3394	74.90	74.90	0.9015
2	1.4545	25.10	100.00	0.7698

After Function	Wilks' Lambda	Chi Squares	Degrees of Freedom	Significance
0	0.0763	28.304	14	0.0130
1	0.4074	9.877	6	0.1299

Summary Stepwise Discriminant Analysis

Variable Entered	Wilks' Lambda	Significance
1. Intensity	0.73871	0.1200
2. Rhythmicity	0.41305	0.0180
3. Persistence	0.33555	0.0283
4. Mood	0.24672	0.0271
5. Adaptability	0.15966	0.0174
6. Maternal Responsivity	0.09999	0.0121
7. Distractibility	0.07630	0.0192

Table 12

Classification Results and Predicted Group Membership for

Low Risk Infants

Actual Group	Cases	A	B	C
Insecure A	1	1 100.0%	0 0.0%	0 0.0%
Secure B	12	0 0.0%	12 100.0%	0 0.0%
Insecure C	4	0 0.0%	0 0.0%	4 100.0%

Percent correct classifications: 100.00%

Table 13

Canonical Discriminant Functions for Stepwise Discriminant

Analysis with 3 Groups for High Risk Infants

Function	Eigenvalue	Percent of Variance	Cumulative Percent	Canonical Correlation
1	1.1130	94.73	94.73	0.7257
2	0.0619	5.27	100.00	0.2414

After Function	Wilks' Lambda	Chi Squares	Degrees of Freedom	Significance
0	0.4456	16.972	6	0.0094
1	0.9417	1.261	2	0.5323

Summary Stepwise Discriminant Analysis

Variable Entered	Wilks' Lambda	Significance
1. Persistence	0.63156	0.0064
2. Adaptability	0.54930	0.0119
3. Rhythmicity	0.44567	0.0095

functions 1 and 2 were not found to be equal. The variables associated with function 1 were contributing more to the group differences than function 2. Function 1 has a canonical correlation of .72 and accounted for 94% of the between groups variability. The use of these variables as the discriminating functions resulted in 71.4% of the cases being correctly classified (see Table 14). Only one case in the avoidant group was correctly classified based on the discriminant function.

In summary, the results of this study indicate that:

(1) when low risk infants and high risk infants are examined together, infant temperament and maternal responsiveness do not predict attachment classification at 12 months;

(2) the temperament variables that have been suggested to predict attachment classification directly were not effective in these analyses as assessed; however,

(3) when infant risk is taken into consideration, temperament and maternal responsiveness predict differently to the attachment classification of low-risk infants and high-risk infants.

Table 14

Classification Results and Predicted Group Membership for

High Risk Infants

Actual Group	Cases	A	B	C
Insecure A	7	1 14.3%	6 85.7%	0 0.0%
Secure B	16	0 0.0%	15 93.8%	1 6.3%
Insecure C	5	0 0.0%	1 20.0%	4 80.0%

Percent correct classifications: 71.43%

CHAPTER IV

DISCUSSION

The purpose of this study was to examine the
contributions of early (i.e. in the first six months)
infant temperament and maternal responsiveness to one-
year attachment classifications in a sample of mothers
and infants, varying in perinatal risk. The results of
the investigation demonstrated that when infant risk was
not considered, temperament and maternal responsiveness
did not predict later attachment. This lack of
significance was found even with a subset of temperament
variables hypothesized to have a very strong relationship
to attachment. However, when considered within the
context of perinatal risk, temperament and maternal
responsiveness were found to contribute significantly to
attachment classifications, albeit differently for low-
risk versus high-risk infants.

Three sets of analyses were carried out to
investigate the joint relationship of temperament and
maternal responsiveness on the development of attachment

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within a transactional model. The first set of analyses
investigated the ability of temperament and maternal
responsiveness to discriminate attachment classifications
for the total sample of dyads, independent of perinatal
risk. The results of these analyses demonstrated that,
temperament and maternal responsiveness, as measured and
analyzed, are unable to predict attachment
classifications. The second analysis examined an
hypothesis posited by Chess and Thomas (1982), of a more
powerful relationship between specific temperament
dimensions (i.e. intensity, adaptability, mood, and
persistence), and attachment. The results of this
analysis were not significant, with the exception of
intensity, which reached marginal significance. These
results further support the contention of no relationship
between attachment classification and temperament (e.g.
Sroufe, 1984).

However, when the same question was asked within the
context of perinatal risk, significant findings were
obtained, suggesting a relationship among temperament,
maternal responsiveness, and attachment classification.
For the low-risk infants, a number of temperament
dimensions (intensity, rhythmicity, persistence, mood,
and adaptability), along with maternal responsiveness,
were found to effectively discriminate the infant's
attachment classification. These results suggest that

there may be many aspects of the infant and the mother influencing the attachment relationship. In fact, the discriminating functions for this analysis correctly classified all of the cases in the analysis, suggesting that no one aspect of temperament can predict attachment classification.

On the other hand, three dimensions of temperament (persistence, adaptability, and rhythmicity), formed the significant discriminating functions for the high-risk infants. These findings suggest that for the high-risk infants, fewer aspects of temperament predict attachment than for the low risk group. But beyond learning that attachment classifications follow a more constricted path for high-risk and low-risk infants, it is important to delineate how this pattern may develop. One way is to examine temperament dimensions that predict attachment classifications for both groups. Perhaps, similarities and/or differences in how the dimensions are characterized may elucidate the transaction process involved.

Three variables, persistence, adaptability, and rhythmicity, were discriminating factors for both the low-risk and high-risk infants. An examination of the mean scores shows that there are differences (though not significant) in the patterns of these dimensions for the two risk groups; patterns, that appear to shed light on

their respective attachment classifications.

For persistence, within group patterns for the low-risk group are similar across attachment classifications (see Figure 1). But for the high-risk group, these same within group comparisons show that the resistant infants are much lower on persistence than the secure or avoidant high-risk infants. Moreover, on this persistence dimension, the resistant infants in the high-risk group also are lower (mean=1.8) than the resistant infants in the low-risk group (mean=2.4). Thus, the persistence dimension of temperament appears to be working differently in the high-risk, resistant group than the other groups, with these infants showing less persistence than either their high-risk counterparts or their attachment counterparts.

In the adaptability dimension, within group patterns for the low-risk group also do not appear to vary (see Figure 2) as is generally true for the high-risk group although this group does show some variability. Again, the high-risk resistant group is lower, although only slightly, on this temperament dimension than any of the other groups.

Unlike persistence and adaptability, within group patterns for the low-risk group do appear to vary for the rhythmicity dimension (see Figure 2). The avoidant (A) group appears to be lower, (mean=1.8) when compared to

Figure 1. Temperament scores on persistence, adaptability, and rhythmicity by attachment classification for high-risk infants.
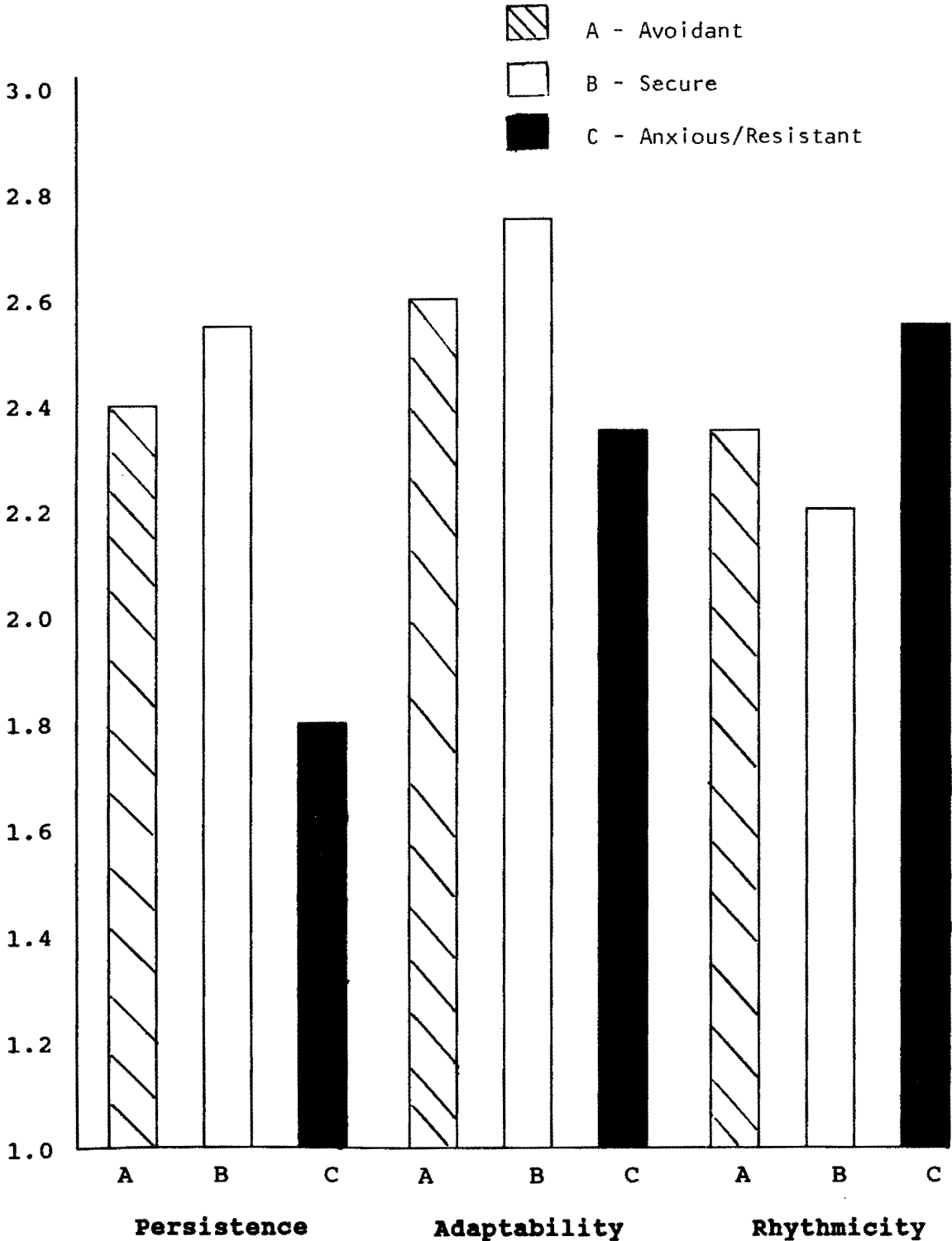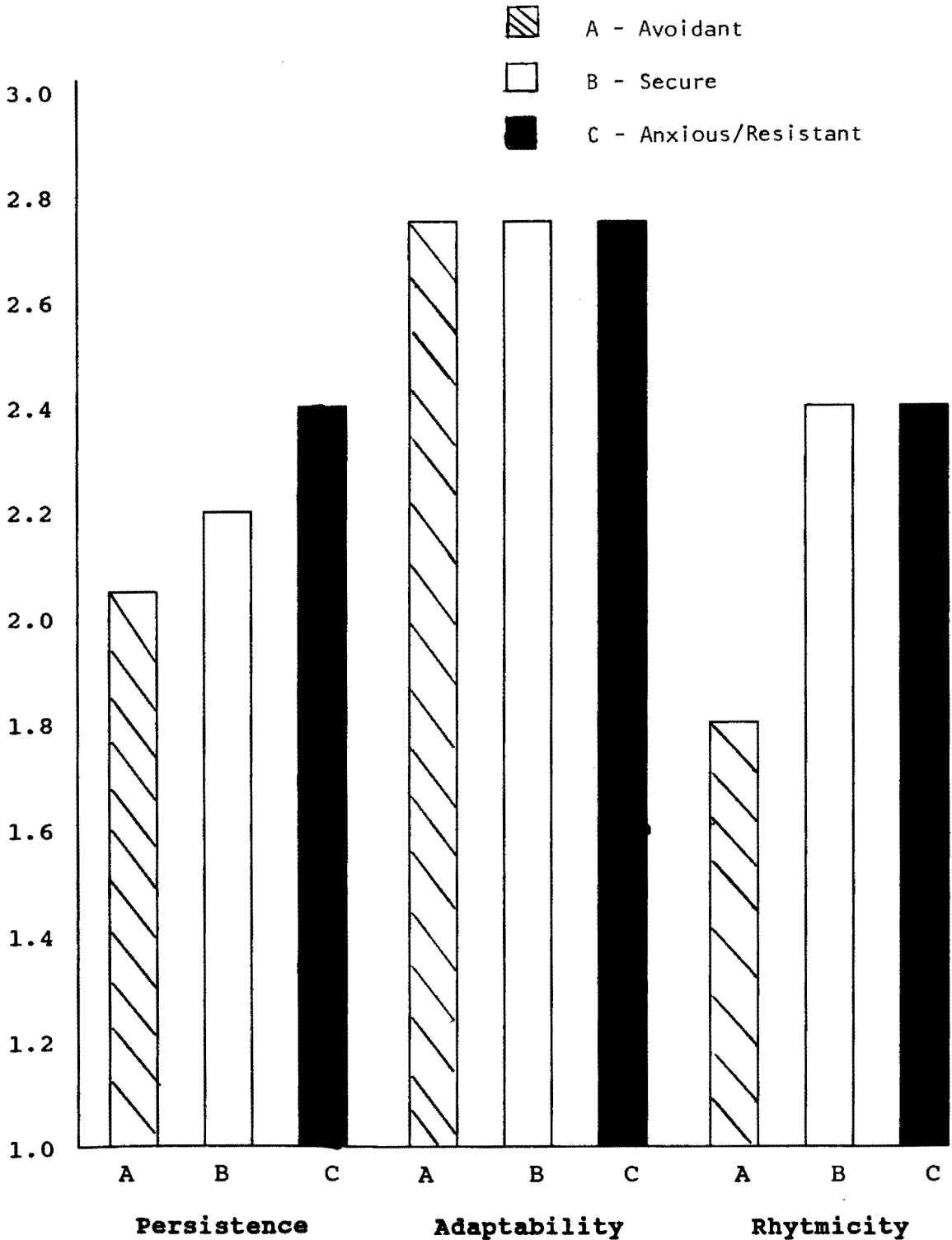
Figure 2. Temperament scores on persistence, adaptability, and rhythmicity by attachment classification for low-risk infants.

the secure (mean=2.4) and resistant (mean=2.4) infants on this dimension. On this dimension, the pattern for the high-risk group does not appear to be that varied. This time, comparing the risk groups, the low-risk avoidant infants appear to be much lower than the high-risk infants in their rhythmicity (see Figures 1 and 2).

The patterns of attachment presented above for high-risk and low-risk infants do show some variability within and between risk groups on some dimensions of temperament examined in this study. Additional aspects of temperament were predictive to infant-mother attachment for low-risk but not for high-risk infants, while maternal responsiveness was only predictive for low-risk infants. Some of the inability of maternal responsiveness to predict later attachment may have been due to the nature of the measure. Perhaps, the structured nature of the interactions between the infant and mother reduced the sensitivity of the measure to detect contingent responsiveness patterns.

Despite the problems with the maternal responsivity measure, the temperament results indicating different patterns of prediction for the two risk groups suggests the importance of a transactional model that recognizes the dynamic complexity of the infant-environment interaction (Sameroff & Chandler, 1975). This model views the infant as becoming organized, through active

participation in his/her environment (Sameroff &
Chandler, 1975),a process probably dependent on
interactions with mother (Sameroff & Chandler, 1975).
The results of this study suggest that high-risk and low-
risk infants may organize their environments with their
mothers differently.

Perhaps the high-risk infant needs more regulatory
responses like persistence, adaptability, and
rhythmicity, in order to engage in interactions with
mother. How these dimensions are expressed by the infant
and interpreted by the adult may set the stage for the
mother's ability to respond effectively to the infant's
needs. An argument against this scenario come from these
data in that it appears that for the high-risk infants,
maternal responsivity, was not as predictive of later
attachment as was infant temperament. However, there is
the measurement problem with this variable referred to
above.

Finally, since the majority of infants in this study
were securely attached with their mothers, it is
important to examine the insecure relationships in order
to understand how they might differ from secure
relationships, and in so doing gain some insight into
both types of relationships. For example, an infant who
was rhythmic and adaptable, but not persistent may have
engaged in less interaction with the mother because

he/she appeared to be independent. However, the infant may not have been able to sustain interactions with the mother if desired, or only if she persisted.

This type of early interaction could manifest itself in a resistant (ambivalent) infant-mother attachment where the infant wants to be near the mother but does not know how to effectively engage her, and becomes frustrated in the end. In conjunction with this, the mother may not be able to always know how much interaction her infant wants if he/she is not effective in making wants known. This could possibly add to the feeling of ambivalence in the infant. This also suggests that the infant may not be effectively organizing his/her environment.

While this study did not directly examine all of the parameters of the example stated above (i.e. mothers' perceptions of infants' signals), the data showing that the resistant high-risk infants in this study were higher in adaptability, and rhythmicity than persistence, provided the basis for the example; thus, suggesting that this type of temperament-attachment pattern may be found in other groups of high-risk infants with similar backgrounds.

Through more direct assessments of the patterns of attachment within varied contexts (such as perinatal risk), additional insight into attachment formation may

be obtained. Possibly by examining individual patterns of temperament and attachment in high-risk and low-risk infants, the formation of attachment can be more clearly defined. Also, more information about the mother's perceptions of her infant's signals, and feelings towards her infant's temperamental style is needed to better understand the dynamics of the relationship.

In conclusion, it appears that predicting attachment, assessed in this study via the Strange Situation, is a complex process. Yet, complexity of the relationships does not preclude a transactional process. To the contrary, a transactional model proposes that many aspects of the infant and the environment influence the development of the infant (Sameroff & Chandler, 1975). The complex combinations thought to underlie the results observed here may have been influenced by varying degrees of the infant's ability to elicit contingent responses from the mother, combined with, the mother's perception of the combination of factors within her infant, and her ability to respond appropriately to the infant.

Some research suggests that for high-risk infants born into low-risk families (e.g. high socioeconomic, and well educated families), the effects of prematurity or perinatal complications may be ameliorated (e.g. Oberklaid et al., 1985; Sameroff & Chandler, 1975). That is, factors such as education and monetary resources and

the development of the infant may influence the mother's ability to be responsive to his/her needs. However, as the results of this study suggest, high economic status and educational attainment, which were common to all of the mothers in this study, does not necessarily mean that mothers and their infants will be securely attached. Variability in predicting patterns of attachment does exist in this population. The results of this study suggest that some of the variability may be attributed to infant temperament, maternal responsivity, and perinatal risk.

Thus as hypothesized, within a transactional model, both infant temperament and maternal responsiveness, as measured, predict attachment classification. However, this is true only when infant risk is taken into consideration. The results demonstrate that the relationship is impacted by infant risk factors, and that the relationship is different for low-risk versus high-risk infants.

While this study does not provide a definitive answer to the debate surrounding infant temperament, maternal responsiveness, and attachment (reviewed above), it does provide an alternative way to address the question. By taking a transactional approach the concurrent effect of these variables on attachment was assessed, and how that effect was different for low-risk

and high risk infants was obtained. This approach also provided the framework for generating hypotheses about how infant temperament might impact an attachment classification.

SUMMARY

Researchers of infant-mother attachment have examined independently the relationship of infant temperament and maternal responsiveness to attachment, finding an inconsistent relationship. The inconsistent relationship could be the result of ignoring the possible interaction effects that temperament and maternal responsiveness may have on attachment. By employing a transactional model which recognizes the contributions of each member of a dyad, this study has added information to the question of whether infant temperament and maternal responsiveness relates to attachment.

Mothers of infants varying in perinatal risk rated their infants' temperament at 2,4, and 6 months of age (corrected age for premature infants) via the Carey Infant Temperament Questionnaire (cited in Thomas & Chess, 1977). Also, mothers participated in a structured face-to-face mother-infant interaction (Lauesen et al., 1984) at 2,4, and 6 months of age (corrected age for premature infants). Attachment classifications were assessed when the infants were 12 months of age

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(corrected age for premature infants) using Ainsworth's Strange Situation (Ainsworth et al., 1978). Discriminant analysis was used to assess the joint relationship of infant temperament and maternal responsiveness to attachment classification.

A relationship among some aspects of infant temeperament, maternal responsiveness, and later attachment was found in this study. However, this study is different from others in that a relationship exists only within the context of perinatal risk, and that the relationship is different for high-risk and low-risk infants. For low-risk infants, both infant temperament and maternal responsivness were predictive of later attachment classification, while for high-risk infants, only infant temperament predicted classification. Overall, the results suggest that with information from both members of the dyad, more insight into the attachment relationship is gained, and that examining the relationship within transactional model is useful because it takes into consideration the contributions of both members of the dyad.

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Appendix A

Descriptions of the Attachment Subclassifications
Assessed via the Strange Situation

There are two subclassifications within the A group:

The A1 infant is best described as displaying more
strict avoidant behaviors.

The A2 infant shows more mixed responses to the
mother at reunion, with moderate proximity seeking.

The B group has four subclassifications:

The B1 infant greets the mother but does not
especially seek to maintain contact.

The B2 infant is similar to the B1 infant but is
more likely to seek proximity to the mother.

The B3 infant actively seeks contact with the mother
resisting release, and may or may not be distressed
in the separation episodes.

The B4 infant wants contact with the mother and
actively seeks it, clinging and resisting release,
and displays more crying and distress in the
separation episodes.

The C group has two subclassifications:

The C1 infant displays proximity seeking and contact
maintaining in the reunion episodes. However, the
behaviors are mixed with the infant resisting
contact and appearing to have an angry tone. He/she
is also likely to be extremely distressed during the
separation episodes.

The C2 infant displays conspicuous passivity with
limited exploratory behavior throughout the
paradigm. Nevertheless, in the reunion episodes
he/she wants proximity to and contact with his/her
mother, and protests against being put down rather
than resisting release.

An Outline to the Results of the Discriminant Analyses

The results of the discriminant analyses are presented in
table format with the following headings:

*Function - the discriminant function based on the
predictor variables which maximizes the between
groups variability.

*Eigenvalue - ratio of between-groups to the within-
groups sums of squares, associated with each
function. Large eigenvalues are associated with
good discriminant functions.

*Percent of Variance - variance accounted for by the
associated function.

*Canonical Correlation - measure of the degree of
association between the discriminant scores and the
groups.

*After Function - the number of the last function
removed. The remaining statistics refer to the
remaining function(s).

*Wilks' Lambda - significance test of the hypothesis
that the means for all discriminant functions in
all groups are equal.

*Chi-Squares - transformation of the Wilks' lambda
to chi-square statistics for significance testing.

*Degrees of freedom - associated with the chi-
square.

*Significance - significance level.

APPROVAL SHEET

The thesis submitted by Belinda E. Sims has been read and
approved by the following committee:

    Dr. Jill N. Reich, Director
    Associate Professor, Psychology, and
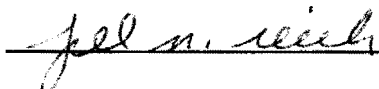   Associate Dean, Graduate School, Loyola

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The final copies have been examined by the director of
the thesis, and the signiature which appears below
verifies the fact that any necessary changes have been
incorporated, and that the thesis is now given final
approval by the Committee with reference to content and
form.

The thesis is therefore accpeted in partial fulillment of
the requirements for the degree of Master of Arts.

_____11 - 16 - 89_____   ___*Jill N. Reich*_____

Date   Director's Signature